Original Communications

THE SIGNIFICANCE OF THE STREPTOCOCCUS IN TRICHO-MONAS VAGINALIS VAGINITIS*

G. F. HIBBERT, M.D., EVANSTON, ILL.

FROM a review of the literature on Trichomonas vaginalis vaginitis, it is apparent that the condition has been known to gynecologists for a long period of time; yet textbooks offer only brief reference as to the bacteriologic characteristics of the protozoon, the symptomatology of the disease and a few vague forms of treatments. During the past few years current literature has been flooded with articles concerning this disease, but from the conflicting reports and the innumerable and unsatisfactory methods of treatment it is quite evident that the problem is far from being solved. In view of these facts it may be possible that one or two sources of error exist; first, the true etiologic factor responsible for this disease has not been found, or secondly, the methods of treatment used are not specific. Therefore, I have approached this problem with these two thoughts in mind, first to attempt to isolate either a specific or an associating cause for the disease, and secondly to institute a method of treatment capable of producing clinical results. However, it is not my endeavor to offer the ultimate solution of this baffling situation but rather to report the results of careful laboratory and clinical observations, hoping to stimulate future workers in this field.

Many writers report that in a large percentage of active cases of Trichomonas vaginalis vaginitis there is an associated heavy growth of streptococci. My own observations showed the presence of gram-positive, nonhemolytic streptococci in the vaginal smears in the majority of these cases. In fact their presence was so persistent that our attention was con-

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centrated upon this organism as the possible cause of the disease either act-
ing independently of the Trichomonas vaginalis or in symbiosis with it.
Our observations also led us to question the pathogenicity of the protozoon
and to doubt whether it had much to do with the disease.

The method of treating the cases reported was by the vaginal applica-
tion of a streptococcic bouillon filtrate produced from the organisms iso-
lated from the patients. This method of treatment was chosen for two
reasons; first, because of the utilization of the specific immunizing agent
which is the toxin in the filtrate; and secondly, for the stimulation of the
reticuloendothelial system which results in establishing a local immuniza-
tion against the streptococcus.

The reticuloendothelial system which figures so prominently in the defense mech-
anism of immunity was first described by Maximow as a large group of cellular ele-
ments that arise from the mesenchyme and whose reaction to stimuli are very similar
if not identical. These cells are found in the mucous membrane, omentum, spleen, liver,
lymph nodes, bone marrow, and loose connective tissue, and are generally known as
hystiocytes. The value in the use of bouillon filtrate, or what may generally be called
actinotherapy is based upon reliable scientific research, and although the best medium
of approach is the skin, the same results are obtained by using the mucous membrane.
This was borne out by the experiments of Besredka in treating puerperal sepsis by the
intrauterine application of tampons saturated with a streptococcic bouillon filtrate;
and also by the application of toxins and antitoxins in anthrax, tuberculosis and
smallpox. Cannon and Pacheco in their work on tissue immunity describe the histo-
pathologic reaction of the skin and subcutaneous tissue immunized by the intracu-
taneous injections of a staphylococcus filtrate. Pilot and Afermow have proved by
their work with staphylococcic filtrate that there is a definite stimulation of the
reticuloendothelial system. Corbus, in his excellent work with the gonococcic anti-
virus relies upon the response of this defense mechanism to produce an immunization
against the gonococcus, this being produced by the intradermal injections of a gono-
coccal bouillon filtrate. Having been convinced by the work of the authors mentioned,
it was thought possible that this method would produce results in this instance, and the
results have been most interesting.

The method of preparing this streptococcic bouillon filtrate is as follows.

A small amount of the vaginal secretion was incubated for a period of forty-eight
hours in a test tube of sterile brain broth in order to obtain a concentrated active
growth of the organisms. The fluid portion of this culture was then poured into a
sterile liter Erlenmeyer flask containing sterile broth. In this medium the or-
ganisms were permitted to grow until there were no longer any living bacteria in the
broth; this was determined by attempting to produce colonies on blood agar plates from
the culture. The average length of time necessary to accomplish this was about
fourteen days. The culture medium was then filtered through a fine grade Berkefeld
filter to remove all dead organisms and foreign matter, and the sterile bouillon filtrate
then placed in the ice box for use. In the early stages of the work only autogenous fil-
trates were used, but because of the lack of necessary space and material, a stock filtrate
was experimented with. The stock filtrate gave us very quick results with the excep-
tion of a few stubborn cases, and in these instances autogenous filtrates were resorted
to, but approximately 94 per cent of the cases were treated with a stock bouillon filtrate.

The technic in treating these patients was in all instances uniform. All
other methods of treatment were suspended, all douches forbidden, and

the patient was only allowed one tub bath daily. In indicated cases repeated cauterization of the cervix was resorted to where cervicitis was present. The vaginal canal was dried with sterile cotton pledgets, and a large cotton tampon saturated with the bouillon filtrate was packed against the cervix and allowed to remain in place for twelve hours, during which time the patient was advised to remain off her feet to aid in retaining the fluid vaginally. This treatment was repeated from two to three times a week until the vaginitis disappeared.

The morphologic characteristics of fourteen different strains of isolated streptococci were studied in the laboratory, and the results from the different media used showed that the type or types of streptococci found were very similar. Of course it must be remembered that one given growth of any organism will show slight cultural differences at various stages of incubation, so some of the differences encountered may be explained in this way. In studying the bacterial flora of vaginal secretions, many nonpathogenic organisms are found, and the predominance of various groups will change as has been pointed out by Curtis. In this work we usually found many gram-negative bacilli, colon bacilli, fusiform bacilli, Doederlein's bacilli, Sarcinae and yeast; but this group represents microorganisms of really no clinical importance in this work. It has been reported by many workers on this problem, that the Trichomonas vaginalis may be found in the vaginal secretions of many patients and never produce an active vaginitis. My observations bear out this statement as will be seen by a series of cases discussed further on in this paper. The question concerning the pathogenicity of the Trichomonas vaginalis is, of course, at once raised, and legitimately so, because it does not seem possible for a large series of patients to harbor large numbers of pathogenic organisms for long periods of time in the vaginal tract and never show a clinical picture of so-called Trichomonas vaginalis vaginitis.

In order to control the cases under observation, all smears and treatments were carried out by me, and a systematic routine in handling the material was observed. Before a patient was classified as a desirable case, all local medication and antiseptic douches were discontinued for one week, and at the end of that time vaginal smears and cultures were obtained. After the cases were acceptable all vaginal douches were stopped, all local application of medication discontinued, and the patient requested to report within three days following her menses in order to obtain further smears and cultures. The presence of a profuse leucorrheal discharge, which acts as an excellent medium for all bacterial growth, proved to be our greatest source of trouble in treating these cases, and while it was not the purpose of this work to treat leucorrhea, it became necessary to lessen the amount of active cervical infection, thereby depriving the organisms of a cultural medium.

For simplicity of discussion, the cases studied, have been divided into four groups. Group I, represents 61 cases, many having been under obser-

vation for one year, and a small percentage of which are still under active treatment. Every case of this group presented a typical picture commonly known as Trichomonas vaginalis vaginitis. The protozoon was demonstrated repeatedly under the microscope in every case. The gram-positive streptococcus was the predominating organism in the field in 53 cases, Doederlein's bacilli in 6, and in 2 no particular organism predominated. Many of these patients had been under various methods of treatment for weeks, with practically no improvement. Clinically, the patients showed in a varying degree the following symptoms: a watery, acid, irritating discharge, extreme tenderness of the vaginal mucosa and external genitalia, associated with itching and burning about the vulva. Direct vaginal smears taken before treatment was instituted usually showed the following picture with a gram stain: a large number of pus cells to the field, scattered squamous epithelial cells, a tremendous number of gram-positive streptococci, and the usual growth of gram-negative organisms. Vaginal examination showed a congested tender membrane and a hyperemic cervix often showing numerous petechial ulcers. After several applications of the bouillon filtrate, the smears showed a marked decrease in the number of pus cells, an increase in the epithelial cells, and a marked decrease in the number of streptococci. With the microscopic changes, the clinical picture showed a corresponding change. The patient was much more comfortable, the irritation in a vast majority of the patients disappeared, and the discharge became pasty in consistency, white in color, much less irritating and less acid in reaction. In many cases the amount of the discharge decreased to such an extent that a napkin was no longer necessary for cleanliness. The vaginal membrane resumed a normal color, was less tender, and the cervix lost its hyperemic color and the hemorrhagic spots disappeared. It was interesting to note that in many cases, marked exacerbations of the symptoms occurred following the first and second menstrual periods just after the treatment had been started. Smears taken at this time showed in every case a tremendous increase in the streptococci; in fact, many of our best growths of the organism used for cultural purposes were obtained during these postmenstrual exacerbations. These recurrences may be logically explained when one remembers that the streptococcus favors a medium in which blood or its constituents exist.

From our observations the results of treating this group may be summed up as follows: Every case where the streptococcus was predominant was benefited, and in practically every case we were able to do away with the vaginal tenderness, the itching, and burning. Thirty-nine cases of the 53 were rendered symptom free for months with no recurrences of the vaginitis. Those cases having an active cervicitis and discharge were very stubborn in their response and required a longer time to obtain results. The average number of applications of the filtrate necessary to do away with the acute vaginitis was 8, but in many cases, remarkable improvement was noted after two or three treatments.

The question naturally comes to mind concerning the Trichomonas vaginalis during the period of treatment. From our repeated observations of hanging drops examined under the microscope, no apparent change in numbers or activity of the protozoon could be ascertained. It was believed, that in those cases where there had been a marked diminution of the discharge, the trichomonas were fewer, but this may have been due to a lack of ample fluid medium hampering their activity. However, it was demonstrated time and time again, that the Trichomonas vaginalis existed in many of the patients rendered symptom free, and no evidence of vaginitis could be observed.

Group II, represents 21 cases in which the Trichomonas vaginalis were present, but no associated growth of the streptococcus. None of these cases during a period of observation of many months have developed an acute vaginitis, in spite of the fact that in 14 there was an existing cervicitis. Eleven of this group were obstetric and 10 gynecologic cases. The fact that the protozoon persisted in these cases may logically be explained by the fact that the profuse leucorrheal discharge provides an excellent medium for the protozoon and also for the hosts of nonpathogenic organisms upon which the Trichomonas vaginalis subsists. On the other hand, the absence of the streptococci may explain the freedom from the watery discharge, tenderness and itching. It is true that the microscopic study of the vaginal smears from these cases, often showed a few scattered grampositive streptococci, but either they were not virulent enough or were not in sufficient numbers to produce a vaginitis, or else the patient's resistance against them was high and no vaginitis resulted. These cases were not treated with the streptococcic bouillon filtrate, but were held under close observation as controls.

Group III, represents a series of 16 patients suffering from an acute vaginitis, but in every case there were no Trichomonas vaginalis present. In 9 of these cases, the gram-positive streptococcus was the predominating organism in the smears. Fortunately, for clinical data, at least six of these 9 patients were children, referred to the gynecologic department of the Central Free Dispensary with the probable diagnosis of acute gonorrheal vaginitis. Study of the smears showed no gonococci, but 6 were definitely due to a virulent gram-positive streptococcus and the remaining 2 were undoubtedly due to irritation produced by foreign bodies found in the vagina. The cases where the streptococci were prevalent responded quickly to the application of the bouillon filtrate and in two weeks were symptom free. Of course, all nonspecific vaginitis in children is not due to a streptococcic infection, but the results show that this organism is responsible for a large number of acute vaginitis cases which have, up to this time, been diagnosed as gonorrheal vaginitis. This mistake is easily made when the streptococci appear as diplococci in the original smear, but in culture develop short chains.

Group IV, while the smallest in number, is of great importance. In order to be convinced that the streptococcus was actually capable of producing a vaginitis either associated with or independent of the Trichomonas vaginalis, I assumed the responsibility of introducing both organisms separately and together into the vaginal canal of five cases in which neither organism was present. The patient from whom the Trichomonas vaginalis was obtained was known to have harboured them in the vagina for a month with no symptoms of a vaginitis, and never showed streptococci in the smears. Three of these 5 patients selected reported for endocrine disturbances and two with backache as their chief complaint, but all 5 were free from the Trichomonas vaginalis and streptococci. In the first three cases, the Trichomonas vaginalis was introduced alone, and a scanty, but a fairly active growth was obtained in all 3 and persisted for weeks during which time absolutely no symptoms of vaginitis developed. After several weeks, an active test tube culture of the streptococci were introduced into these 3 patients, and all 3 developed a mild acute vaginitis. Itching and irritation was noticed by all 3, and 2 developed the typical watery, highly acid discharge. All of these patients were immediately treated with the bouillon filtrate and after 5 or 6 applications were symptom free. One patient did have a mild flare-up of the symptoms following her next menstrual period, but this was treated and since then has been free of symptoms.

The other 2 patients of the original 5 were subjected to a vaginal application of the active streptococcic culture alone, and both developed a very active vaginitis within one week. The streptococcus was then isolated, cultured and autogenous filtrates were made and used immediately. The patients responded nicely to the treatment and after a few weeks had no vaginal irritation or discharge. Realizing the dangers involved in this type of experimental investigation especially where streptococci are used, it was decided to limit this group to 5 cases.

The material used in this paper was obtained from the Gynecologic dispensary of Rush Medical College, and private practice. This work was made possible by the splendid cooperation of Miss Leona Birkeland who carried out all of the laboratory work involved, and to whom I wish to express my deep appreciation.

The conclusions drawn from the observations recorded are as follows:

1. The Trichomonas vaginalis may be found in the vaginal secretions of many women for long periods of time without producing an acute vaginitis.

2. In a large percentage of the cases having acute vaginitis where the Trichomonas vaginalis exists, there is an associated predominant growth of a gram-positive, nonhemolytic, short chain streptococcus present.

3. This type of streptococcus is capable of producing an active vaginitis when not associated with the Trichomonas vaginalis.

4. By repeated vaginal application of a specific streptococcic bouillon filtrate the active growth of the organisms in the vagina die off, and the active vaginitis subsides in spite of the persistence of the protozoon in the secretions.

636 CHURCH STREET.

ABSTRACT OF DISCUSSION

DR. IRVING F. STEIN.—There are many points in this paper that require critical interpretation. Doubt no longer remains that there is such a definite symptom-complex, and that the presence of a large number of trichomonas in the vaginal discharge can usually be accurately predicted not only on the history of the patient, but from the characteristic discharge. Before we became interested in Trichomonas vaginalis vaginitis, many patients were believed to have chronic gonorrhea, and have conclusively been shown in the last few years, since we have been paying attention to this, to suffer from this condition. Gonococci are rarely if ever associated with trichomonas. In our own work almost every case of trichomonas also showed streptococci. Streptococci along with a number of other microorganisms are commonly found in smears and cultures. One must bear in mind from the work of Curtis, which is corroborated by our work and by that of many others, that the bacteria in the vagina in health are the same microorganisms found in the ordinary leucorrhea and purulent leucorrhea in which there are no trichomonas. Even routine smears from the vagina of infants and children admitted to the Children's Hospital yield in fully 90 per cent, gram-positive diplococci, with all the characteristics of streptococci and in these children there was no vaginitis. In the report which Miss Cope and I made to this Society last November, we found streptococci in all 24 cases of Trichomonas vaginalis vaginitis. We also found streptococci in all but three patients examined in whom there were no trichomonas. We never see a preponderance of streptococci in these smears; we see them as gram-positive diplococci. In the cultures sometimes the streptococcus would become predominant because streptococci grow more favorably on artificial media than do the other organisms. Many writers have considered the flagellatis pathogenic in Trichomonas vaginitis. Plass ascribes this rôle to yeasts. Dr. Hibbert ascribed it to the streptococcus. If the streptococcus is the cause, what rôle does the trichomonas play in this particular type of vaginitis which contains the same bacteria that we find in the absence of trichomonas? Why does not the streptococcus produce the same vaginitis in cases in which the trichomonas is not present? Dr. Hibbert said he found ''in addition to the streptococcus gram-positive diplococci, colon bacilli, sarcinae and yeasts, but this group represents microorganisms of no clinical importance in this work.'' How does he arrive at this conclusion? Has he made any experiments to prove this? How does he know that colon bacilli, sarcinae and yeast produce no symptoms of importance? Again, he uses the argument against Trichomonas vaginitis that many patients with parasites in the vagina never develop vaginitis. The same argument holds that many patients with the same bacterial flora as he found never have vaginitis. The symptoms, of course, are the result of an inflammatory reaction, not just the presence of the bacteria, and may be produced by the bacteria or the protozoa or more likely, both in symbiosis. Many writers believe in such a symbiosis, which Dr. Hibbert also mentioned in his paper.

Dr. Hibbert says that with his treatment the discharge changes in character, a familiar observation to all who have treated Trichomonas vaginitis by any method; also that the discharge becomes less acid in reaction. He does not state how he measured the acidity. I would be very much interested to know whether it was measured or whether this is merely an impression. The recurrence of discharge that

occurs after menstruation is explained by Dr. Hibbert in recalling that the strepto-
coccus favors a medium in which there is blood. Trichomonas also grows best in
human blood serum, so it is no argument in favor of the streptococcus.

Dr. Hibbert made mass cultures of the vaginal flora in brain broth in which
diplococci and other bacteria as well as streptococci grow, and he called it a *strepto-
coccic bouillon filtrate* with utter disregard for the other organisms that were present.

Dr. Hibbert observed that many patients returned symptom-free after treatment
with his method in which the trichomonas persisted. This is contrary to our experience.
In almost any method by which we treated Trichomonas vaginitis the trichomonas
quickly disappeared. If in his series the trichomonas persisted, I think the report is
rather unique in this point. I think almost everyone who has deliberated on this will
agree with the statements I have just made.

Also, Dr. Hibbert mentioned a typical *watery* discharge. I have never seen a watery
discharge in Trichomonas vaginalis vaginitis. It is a sticky, purulent, bubbly or
foaming discharge. It is thin enough to ooze out of the vagina, but at no stage of the
disease have I seen a watery discharge.

In Group II he had 21 cases in which there were no streptococci present. We have
not seen many cases with trichomonas in any numbers in the vagina, which did not
also contain streptococci. We found them in 95 per cent of the cases by the smear and
culture methods.

With reference to his mistaking streptococci in diplococcic form from gonococci in
children, this can easily be obviated by using Gram's stain.

As to his observations on using the filtrate therapeutically, he noted improvement
in the vaginitis and leucorrhea and persistence of the trichomonas. I think this part
of the work definitely requires confirmation.

DR. EDWARD L. CORNELL.—I agree in the main with everything Dr. Stein has
said. If you go into the history of these patients with trichomonas more carefully, you
will find on close questioning that most of them have an increase in the discharge
after the menstrual period. Formerly I believed that these women did not have symp-
toms, but it is so common for the average patient to have symptoms with trichomonas
that I have for the last year been closely questioning those who state they have tricho-
monas with no symptoms.

Almost invariably in these cases of symptomless trichomonas, the mucous membrane
surrounding the cervix and the mucous membrane in the vaginal vault and close by
the cervix contained pinpoint granulations that are quite characteristic of this type
of discharge. I have never seen those pinpoint granulations in any other type of
leucorrhea except that associated with trichomonas.

If Dr. Hibbert can produce with his streptococcus a typical granular type of
vaginitis without the presence of trichomonas, then we will have to believe him. But,
until he is able to do that, I doubt very much whether we are at the bottom of the
question.

DR. H. C. HESSELTINE.—I have already stated that I considered the trichomonas
to be nonpathogenic to human beings. In nearly one hundred patients having the clini-
cal entity of Trichomonas vaginalis vaginitis there has been a gram-positive coccus
present, and quite often a small gram-negative coccus. The former appears in smears
as a diplococcus usually, but in cultures short chains are formed.

To show a relationship of these bacteria to the trichomonas, I have tried to culture
the flagellate in the absence of both organisms, but without success. Two methods
have been used in separating them: The first was by washing the mastigophora in
warm Locke's solutions and collecting them at the bottom of long glass cylinders;
the second was individual isolation by micromanipulation. The trichomonas disinte-

grated quickly but left no living bacteria, which indicates that the bacteria ingested are destroyed, but when bacteria were added to these cultures they continued to live.

I have used astringent douches and directed the therapy to the cervix on the assumption that the bacteria are in the deeper vaginal tissues and cervical glands. Even an innocent looking cervix must be suspected as a focus for bacteria.

Further support is lent by the exacerbation of this clinical entity following the catamenia, which is comparable to exacerbations of gonorrheal infection of the cervix.

I have obtained as good results by the treatment outlined above as by any other method. If this idea is correct, a satisfactory explanation for the chronicity of this disease is available.

DR. CARL HENRY DAVIS.—It is undoubtedly true that streptococci will produce a vaginitis, but I do not understand that Dr. Hibbert has been able to produce with his cultures a condition which is similar to the one we have learned to associate with an infection with Trichomonas vaginalis. We have no idea how long after the initial infection with the trichomonas the typical vaginitis with symptoms may develop.

Dr. Stein and his associates have shown that some types of streptococci are commonly found with the trichomonas in the cases with the typical vaginitis, and it is entirely possible that the two organisms must work together to produce this condition. Additional clinical evidence may be obtained through careful bacteriologic studies of every case presenting the typical vaginitis.

The study which Dr. Hesseltine has started is interesting but does not seem important from the clinical point of view, since it will only show whether or not he can obtain a pure culture and continue to grow it for a long period of time. It is of no special importance clinically, since bacteria cannot be kept out of the vagina, and he will be unable to determine whether the Trichomonas vaginalis alone is capable of producing the vaginitis.

I formerly found it difficult to carry cultures through the winter months, but using Locke's solution to which is added human blood serum containing a moderate number of red cells and making transfers from the bottom of the tube every third day, we have carried one culture for over two years.

It is easy to relieve the symptoms of vaginitis, and it might be accomplished in many different ways. If one does nothing more than introduce a speculum, dry the vagina, and introduce a dry tampon, it may be impossible to find the organisms when the patient returns the following day; the patient will also obtain considerable relief. However, in my experience it has not been possible to relieve patients permanently of symptoms unless I could keep them free from the Trichomonas vaginalis. Dr. Hibbert's results from treatment do not indicate that he has obtained as prompt relief as we can obtain from many other methods. His filtrate may hasten the destruction of the streptococci and prove a valuable aid in stubborn cases, but at present he has not followed his patients for a sufficiently long period to assure us that the Trichomonas vaginalis is a harmless organism in the vagina which is free from streptococci. We hope he will continue this study and keep his patients returning for postmenstrual checks for long periods as a means of answering some of our present doubts.

DR. N. S. HEANEY.—We have used this treatment on a few patients resistant to all attempts to cure them. We have not had these patients under observation long enough to come to a definite conclusion, but a considerable number got relief from the profuse discharge more quickly and are now more comfortable than they have been under any other treatment.

DR. J. P. GREENHILL.—I regard some of the arguments brought forth by Dr. Hibbert as fallacious. He said the trichomonas organism is not pathogenic because it may be found in the vaginas of women who do not have any symptoms. In the first

place some women who deny having symptoms, will, if closely questioned, admit having some disturbance. Furthermore, we all know that a large proportion of individuals, especially non-smokers, harbor the pneumococcus and other pathogenic organisms in their throats and mouths and yet have no symptoms referable to these bacteria.

The description which Dr. Hibbert gave of the improvement in the clinical symptoms and the changes in the vaginal flora which followed the use of the filtrate vaccine are identical with those which follow my treatment and that recommended by others. It seems that the same results may be obtained by a large variety of treatments. As Dr. Heaney mentioned, in intractable cases we may be able to obtain excellent results, at least temporarily by changing to a new form of therapy. Because of this fact I have for a long time been changing from one form of treatment to another in stubborn cases. It has frequently been observed that women have recurrences when they have nervous upsets or are run down physically. The constitution of the woman undoubtedly plays a rôle.

Dr. Hibbert's work is most important. More such investigations may shed light on a specific cure for the vaginitis which is associated with the Trichomonas vaginalis, even if the latter is not pathogenic.

DR. HIBBERT (closing).—It was not my desire to offer the ultimate solution of this problem. I have treated many cases of Trichomonas vaginalis vaginitis in the dispensary and in my private practice with all other methods, and I believe the results obtained with the streptococcic filtrate are more permanent. I have not treated cases free from vaginitis. I have them report back once a month. Where the patients had to wear a pad because of the discharge soiling the clothing before treatment, they have not had to do it, following two or more applications.

In patients with active vaginitis it is not unusual to find excoriations over the entire perineum. I have seen them with a great preponderance of streptococci in the smears taken, come into the dispensary, with a highly acid discharge, severe enough to cause them to stay off their feet. After two or three treatments that discharge disappears provided they have no infection that drains down from the cervix. Chronic cervicitis will produce irritation and leucorrhea regardless of the presence or absence of trichomonas.

I have taken repeated hanging drops and could never satisfy myself that there is an increase in the trichomonas during menstruation. Smears three days postmenstrual show large numbers of streptococci.

Transplanting the trichomonas was done by means of a sterile glass spoon, or rod. It is true that I found a gram-negative organism when I made this filtrate, and in my experience, after forty-eight hours, the streptococci were so active that the gram-negative organisms can be ruled out. It is true that there is some toxic material produced by gram-negative organisms, but the preponderance of streptococci compels me to say that practically all the filtrate except a very small percentage was the result of the activity of the streptococci.

The question was raised, what rôle does the Trichomonas vaginalis play? I cannot answer it except as Dr. Hesseltine did, that the bacteriologists who have studied the question for years believe they are simply saprophytic organisms that live on pathogenic or nonpathogenic bacteria. Under the Wright stain or methylene blue stain you will find many trichomonas with their cytoplasm containing bacteria.

The difference between the vaginitis produced with streptococcus alone and the vaginitis produced with streptococcus and trichomonas was that the pinpoint ulcerations on the cervix did not occur in the Streptococcus vaginitis. It is a question in my mind whether petechial spots on the cervix would not have appeared if the streptococcic infection were allowed to go on indefinitely. I have seen those hemorrhages following the prolonged use of a vaginal pessary and the lack of proper hygiene, and no streptococci present.

TUBAL CONTRACTIONS IN RELATION TO THE ESTRUS CYCLE AS DETERMINED BY UTEROTUBAL INSUFFLATION

MAURICE J. WHITELAW, M.D., NEW YORK, N. Y.

(From the Department of Anatomy, the University of Rochester School of Medicine and Dentistry)

CONTRACTIONS of isolated muscle strips of the fallopian tube have been repeatedly demonstrated since the classical experiments of Kehrer,[7] Gunn[5] and others. It was through the work of Corner[4] and his associates, however, that a new understanding of the physiology of the tubes was obtained.

Seekinger,[14] working on the contraction of the sow's oviducts, found that there was a cyclic change in the contraction rate of isolated strips of the tube. At estrus the number of contractions was 13 to 15 per minute and irregular in nature, while during the interestrus period they were only 4 to 6 per minute and very regular in character. Seekinger and Corner[15] demonstrated this same finding for Macacus rhesus, while Seekinger and Snyder[16] extended this work to the human fallopian tube. Kok,[8] a German investigator, however, failed to obtain this difference in rate between the interestrus and estrus periods in the sow.

In 1920 Rubin[10] presented his insufflation test as a method for determining the patency of the human tubes. It was not until 1925, however, that kymographic records were made by Rubin[12] of the pressure changes during uterotubal insufflation. After the initial rise in pressure, which was probably caused by the resistance of the uterotubal junction, the manometer began to record changes in pressure. That these manometric fluctuations might be due to tubal peristalsis was Guthmann's[6] theory, for these fluctuations in pressure were never present if the tubes were occluded.

Rubin[13] showed that these changes in pressure were not intra-abdominal in nature by insufflating excised tubes and obtaining the same results as in vivo; and that they were not uterine in character, for when he ligated the tubes and insufflated the uterus after having made a small aperture in it with bullet forceps, only rarely did he get pressure changes and these were not of the same type as the tubal pressure changes. They could have been caused, therefore, only by contractions of the fallopian tube.

The problem that therefore confronts us is: is there a correlation between the cyclic changes in contraction rate of the fallopian tube of the sow (as recorded by muscle strip preparations) and those of the Rubin test as determined by uterotubal insufflation?

The domestic sow was selected as the most suitable animal for our study of insufflation for three reasons: (1) The sow has a definite cycle (twenty-one days), ovulation occurring spontaneously. (2) The spon-

taneous contractions of the fallopian tube of the sow exhibits a cyclic variation, which for all practical purposes may be considered the same as in the human species. And (3) of most importance, through the work of Corner[3] it is possible to date material obtained from the abattoir by a histologic study of the changes that take place in the uterus and ovary.

MATERIAL

The female genitalia of the sow were obtained through the cooperation of a nearby abattoir.* The material was procured within ten minutes after the animal had been killed and was immediately immersed in a porcelain-lined pail containing cold Locke's solution at a temperature of about 5° C. It was noted that the tubes contracted much better if kept in cold solution until used. As soon as the genitalia were put into the cold solution, the tubes became visibly active for several seconds and this was used as a criterion of the condition of the tube. All tubes that appeared lifeless were discarded. The active ones were removed to the laboratory for study.

A tube with the stump of uterus attached was placed in freshly prepared oxygenated Locke's solution which was kept in a constant temperature bath of 37.5°. A block of uterus and ovary was put into Bouin's fluid for future histologic study. A ring of the isthmic portion of the other tube 1 cm. in length was removed and its contractions were recorded by suspending it in the same Locke's solution.

The insufflation apparatus used was for all practical purposes the same as that employed clinically in the Rubin insufflation test.[11] It consisted of an oxygen tank with a reduction valve which was connected to a siphonmeter, one discharge of which represented 35 c.c. of the gas. From the siphonmeter a rubber tube led to a glass cannula, the other to a mercury manometer with a cork float to which was attached a writer that recorded on a kymograph such as is ordinarily used in the physiologic laboratories. A time clock, recording minutes, completed the apparatus. The cannula was inserted into the uterine stump and securely tied. The oxygen was then allowed to pass through the uterus and tube under a pressure of 15 pounds. The manometer rose steadily and only began to drop when oxygen bubbled from the fimbriated end of the fallopian tube. Each rise in the mercury column was usually characterized by the fact that no oxygen passed out of the tube. The fall in pressure was coincidental with the passage of the gas through the fimbria. Rises in the manometer did take place with gas bubbling continuously through the infundibulum. During these rises there was a slowing of the rate of flow through the ostium abdominale and the resultant kymographic curve was rounded at the top. Complete stoppage of the gas with its sudden release was recorded as a sharply breaking, peaked curve.

In a number of early experiments, changes in the rate of flow of the gas were tried to determine whether this would have any effect on the type of kymograph record. It was found, however, that in accordance with Rubin[13] there was no demonstrable difference as long as the rate stayed within certain limits, namely, one discharge of the siphonmeter every twenty seconds to one discharge every forty-five seconds.

Forty specimens representing all stages of the cycle were insufflated through the uterus. At estrus, however, only a limited number were

found that could be insufflated, due to a complete closure of the tubo-uterine junction by the hypertrophy of the lymphatic system in that region. This fact had been previously demonstrated by Andersen[1] for the sow.

Andersen[2] examined the sow's tubes in respect to their histology and physiology and demonstrated that there is at estrus a hypertrophy of the villi at the tubouterine junction and "the size and position of the villi themselves are such that in the event of pressure from the direction of the uterus they may be shoved back over the tubal opening so as to close it, acting as a one-way valve." She found that the pressure neces-sary to force normal salt solution through the tubouterine junction dur-ing estrus was on the average over 200 mm. Hg, while during the rest of the cycle the pressure was about 50 mm. Hg.
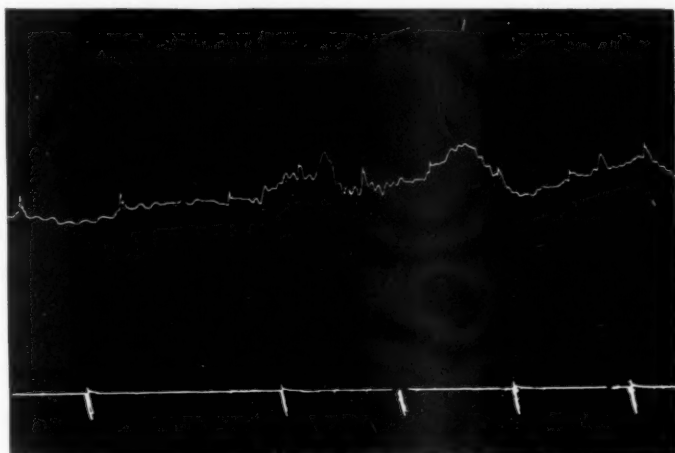

Fig. 1.—Insufflation from the infundibulum at estrus.

In my specimens at estrus, the pressure was raised to 200 mm. Hg and still no oxygen passed into the tube; the uterus, however, usually burst before this pressure was reached.

It had been found that mechanical means of removing the blockade caused by the dilatation of the lymphatic sinuses at the tubouterine junc-tion never fully succeeded. If the gas did pass through after mechanical removal of the obstruction, no changes in pressure were noted. The danger of injury to the tube was too great by this method and therefore had to be discarded.

In the few patent specimens at this stage which showed no macro-scopic hypertrophy of the lymphatics at the tubouterine junction, the initial rise in pressure was low, being at 20 mm. Hg. Immediately after the gas had passed through the fimbriated end, rhythmic contractions of the tube started, causing the rises and falls in manometric pressure. These changes in pressure were for nearly the whole of the insufflation

remarkably uniform in character, the height of the contractions being identical with each other (see Fig. 2).

It was noted that there was a tendency for these pressure changes to rise and fall gradually from a base line so that the composite picture

Fig. 2.—Peruterine insufflation at estrus.
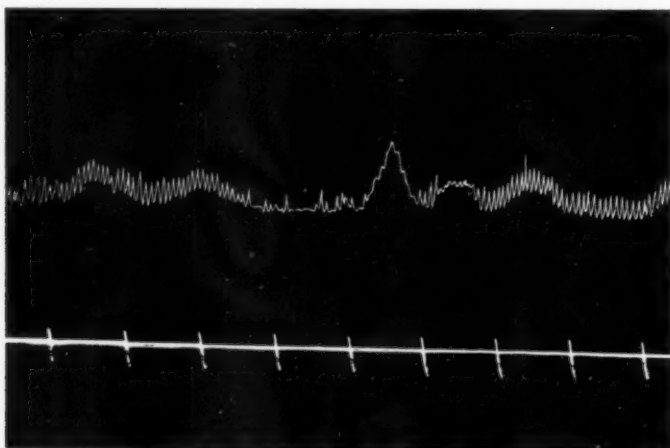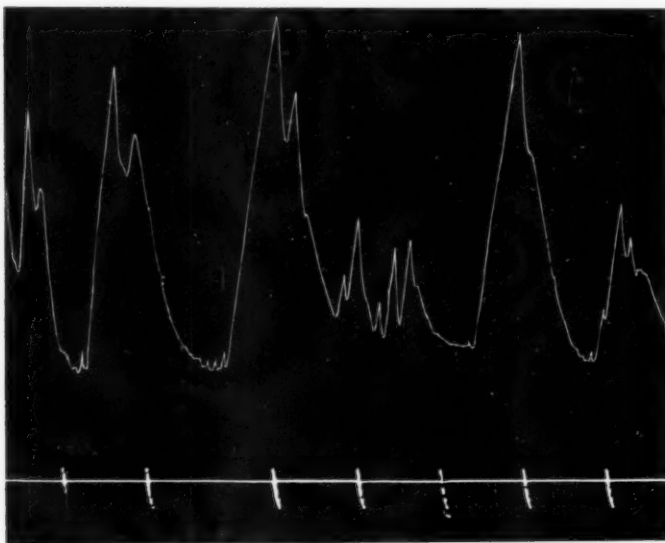

Fig. 3.—Peruterine insufflation third to fifth day of the cycle.

presented a wavy appearance. The number of contractions recorded per minute averaged fifteen, which is strikingly like the muscular contractions at this stage as recorded by isolated strips on the kymograph, which average thirteen to fifteen per minute.

During the interestrus period, it was impossible to show this picture

of definite changes in manometric pressure. Every specimen differed from the other. Even two tubes taken from the same animal showed no similarity. The initial rises in pressure were markedly varied, ranging from 40 to 180 mm. Hg. In some tubes, periodic fluctuations of the same size did occur but these only lasted for about thirty seconds at the longest. No correlation could be discovered in the number of contractions as recorded by the muscle strip preparation and that of insufflation. A few tubes that showed all the evidence of being motile gave very slight pressure changes, falling off slowly from the initial peak in an irregular fashion (see Fig. 6). It was never possible to predict beforehand what type of curve one would get from uterine insufflation at the interestrous period. Through the kindness of Dr. Rubin, I was able to examine his kymographic records, and on comparing this interestrus
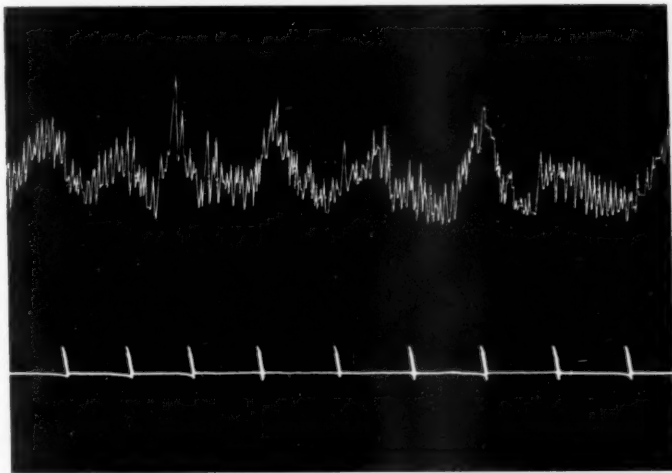

Fig. 4.—Insufflation from the infundibulum third to fifth day of the cycle. Note the staircase effect.

curve of peruterine insufflation with those recorded on his patients, it was found that a large number of records were very similar in nature.

At the suggestion of Dr. Rubin, attempts were then made to insufflate the tubes from the infundibulum. Thirty specimens, representing all of the stages in the cycle, were used for this method.

The procedure was to insert the cannula two and a half centimeters into the fimbriated end of the fallopian tube, the uterine stump being left attached. As soon as the release valve on the oxygen tank was opened, the infundibulum of the tube with the ampula was blown up in a balloon-like fashion. This condition persisted throughout the insufflation period. All of the changes in manometric pressure, therefore, could only have been initiated by the contractions of the lower extremity of the tube, namely the isthmic and intramural portions.

In order to test this hypothesis, a small-bore glass cannula was inserted into the fimbriated end and pushed down to the isthmus. The portion occupied by the cannula was then tied by winding thread securely around it. Under these conditions,

the recordings were identical with those made when the cannula was just inserted into the infundibulum and showed that this portion of the tube does not actively participate in the production of the contraction curves (see Figs. 8 and 9). When the tube was severed at its junction with the uterus, the contractions were not influenced either in rate or amplitude and hence demonstrate that the uterus does not play any rôle in the pressure changes during insufflation. Portions of the tube were then snipped off from the uterine end in order to determine whether the intramural or isthmic portion caused the pressure changes.

When the tubouterine junction was cut, there was no change in the rate of contraction in most of the specimens. In a few, there was a change in rate of contraction, but this was not very marked nor were the results uniform; in one there would be an increase in the height of contractions and a slight slowing in rate, while another
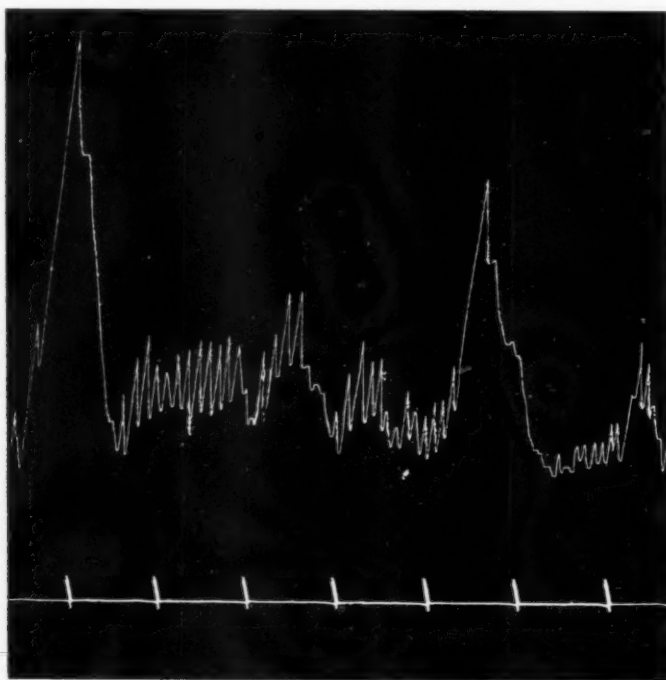
Fig. 5.—Insufflation from the infundibulum tenth to twelfth day of the cycle.

tube would show the reverse. Mikulicz-Radecki[9] in his work on human material had concluded that cutting the intramural portion increased the number of contractions, but I have been unable in the sow to observe this uniformly in all cases.

The tubes were then cut off leaving a ring 1 cm. long, projecting from the cannula's tip. The record on the kymograph immediately began to describe perfect rhythmic changes. The contractions started from a definite base line and returned to it, differing from insufflation of the whole tube where the contractions gradually rose and fell in a staircase effect. The pressure changes produced by these contractions were 3 mm. Hg.

The 1 cm. strip of the tube was then removed from the cannula, placed in oxygenated Locke's solution and its contractions recorded by means of a kymograph in order to determine the number of contractions. The number of manometric changes and the number of contractions were identical for the same strip, varying

from 13 to 15 contractions in the different specimens. All of these tubes were between the seventeeth and nineteenth days of the cycle (see Fig. 7).

At estrus, the gas passed rather easily through the tube. The fluctuations at the start were very shallow in nature and rounded at the top and within a few minutes either became very irregular in character or disappeared entirely so that the tracing showed only a straight line (see Fig. 1).

On the third to fifth days of the cycle, however, the record showed a remarkable change. Fluctuations began in most cases almost immediately after the initial rise, which was somewhat lower than at estrus being around 20 mm. Hg. In some specimens, however, it was necessary to insufflate for a longer period of time before the
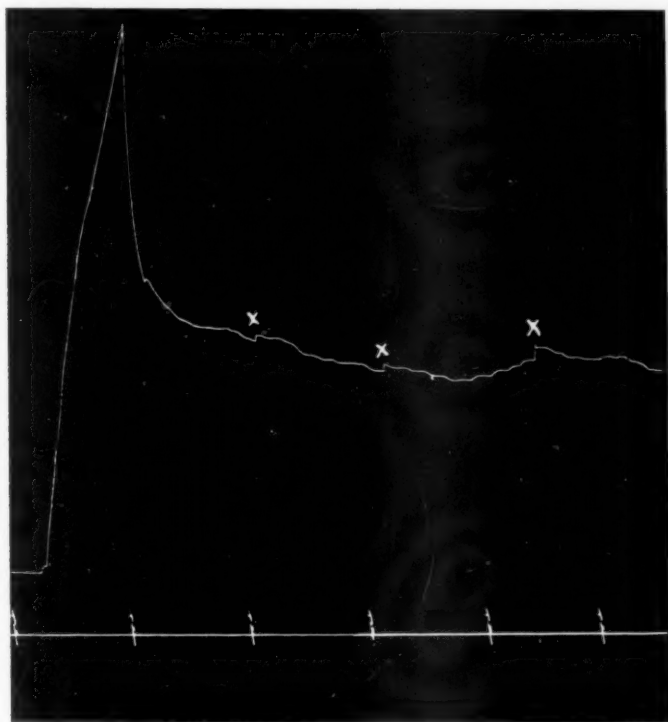
Fig. 6. Peruterine insufflation on same specimen as Fig. 5. *x* denotes artifacts caused by manometer discharging.

fluctuations at this stage were 13 to 15 per minutes as was the muscular contraction curve from the isthmus (see Fig. 4).

It was noted that these pressure changes did not stay on a base line but rose and fell in slight swells and that the curves broke sharply, being peaked at the top. In some specimens the perfect rhythm of the fallopian tube was interrupted at varying intervals by an enormous rise in pressure in the manometer. Immediately afterward the tube returned to its normal behavior.

From the sixth to the seventeenth day of the cycle the rhythmic character of the pressure changes still persisted but the fluctuations were not as numerous. There was, however, a much greater change in pressure, which was often ten times as high as that obtained between the third and fifth days. So far no definite correlation has been established for the period. All that can be said at this time is that the contractions are regular and are between 5 and 9 to the minute (see Fig. 5).

From the seventeenth day to the nineteenth there was again an increase in the rate of 13 to 15 per minute and the record resembled closely the third to fifth days (see Fig. 9).

The difference in insufflation from the uterine end and from the fimbriated end was then checked on the same tubes during the interestrus period.
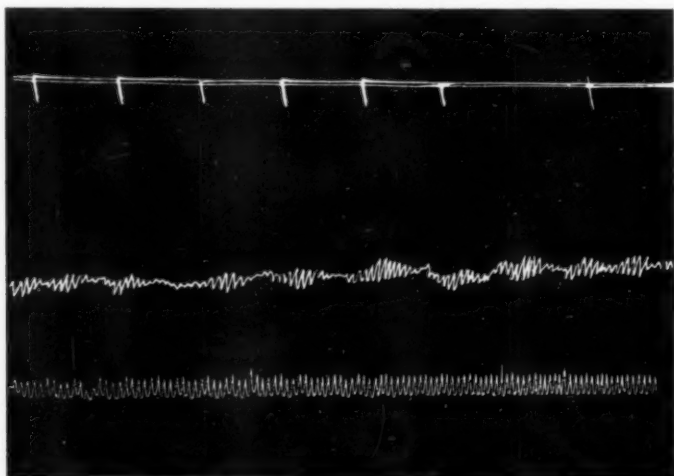
Fig. 7.—Insufflation of a strip of the isthmus one centimeter in length. Cannula has been pushed down to isthmicoampullary junction. Upper record shows the typical estrus type contractions of the same one centimeter isthmic strip run as a muscle preparation (seventeenth to nineteenth day of the cycle).
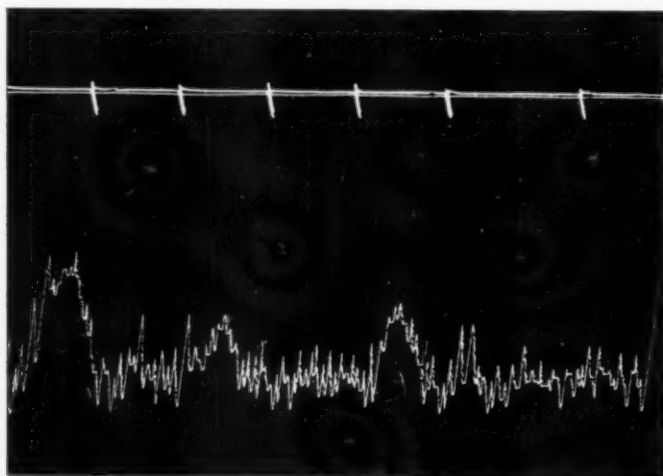
Fig. 8.—Same preparation as Fig. 7. Cannula pushed down to isthmicoampullary junction, isthmus and tubouterine junction still intact.

The tube was insufflated first from the uterine end under the same condition as had prevailed for the other experiments. After a sufficient time had elapsed to obtain a kymograph record, a period which usually lasted thirty minutes or more, the cannula was removed from the uterus and inserted into the fimbria. During this procedure the cannula was disconnected from the tubing, the oxygen being permitted

to pass through at the same rate it had maintained during the experiment. After the cannula had been tied into the ostium of the tube the rubber tubing was then connected and a record made.

The results that were obtained under these conditions were analogous to those which had been derived from different tubes. Uterine insufflation showed irregular rises of pressure with no periodicity while the fimbriated insufflation was a beautiful record of rhythmic pressure changes (see Figs. 5 and 6).

DISCUSSION

It is suggested that the reason for the irregularity of manometric movements during interestrus obtained by peruterine insufflation is that the gas in passing contrary to the peristaltic waves in the tube acts as an irritant to the ampulla, and in so doing interferes with the periodic contractions of the tube. When one insufflates with the wave the pressure changes recorded are perfectly rhythmic in nature.
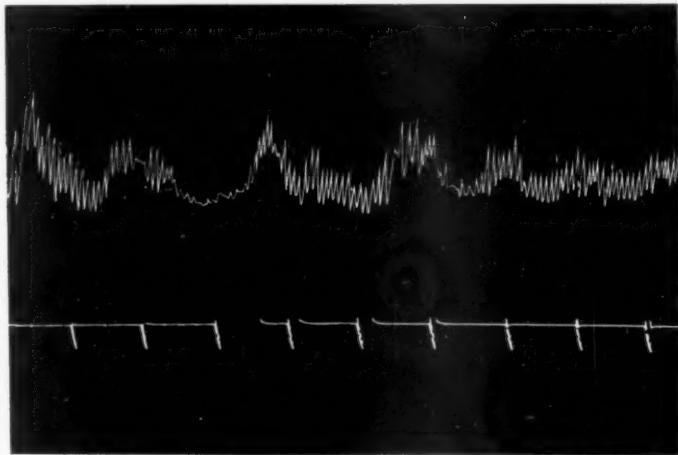
Fig. 9.—Insufflation from the infundibulum seventeenth to nineteenth day of the cycle.

There seems little reason to doubt the rises and falls in manometric pressure are brought about by the simple contractions and relaxations of the tube, for small strips of tube show these rises and falls of manometric pressure which are, at least during the seventeenth to nineteenth days of the cycle, exactly the same in rate as the circular muscular contractions of the tubes.

SUMMARY

1. There is a cyclic variation in the pressure change of the sow's fallopian tube as recorded by the kymograph during insufflation from the infundibulum. It is most rapid immediately after estrus and before it. The pressure changes are 13 to 15 per minute. During the sixth to the seventeenth days the pressure changes are slower and higher and average from 5 to 9 per minute.

2. Insufflation from the infundibulum at estrus results in an irregular curve.

3a. Insufflation from the infundibulum gives a record of the contractions of only the isthmic portion of the tube including the intramural portion in which the infundibulum, the ampulla and the uterus play no rôle.

b. The isthmus and intramural portion of the tube exhibit the same rate and type of contractions.

4. Peruterine insufflation is at estrus usually impossible in the sow because of the mechanical anatomical obstruction of the tubouterine junction. When this obstruction is not present the contractions average 15 per minute.

5. Peruterine insufflation at interestrus gives an irregular type of curve as a rule which is unpredictable.

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THE FASCIA SURROUNDING THE VAGINA, ITS ORIGIN AND ARRANGEMENT*

NATHAN P. SEARS, PH.B., M.D., SYRACUSE, N. Y.

(Associate Professor Gynecology, Syracuse University)

DESCRIPTIONS of the pelvic fascia now in the literature, while complete in their analysis of the anatomical features as a whole, have more or less neglected the practical surgical aspects to the furtherance of controversy and misunderstanding. The purpose of this report is to describe only the layers which surround the vagina and are accessible in repair of birth injuries. The greatest misunderstanding concerns these layers.

From the literature I will refer briefly to such work as is needed to provide a background for my description.

Tandler[1] divides the pelvic connective tissue into three main groups: first, the fascia covering the pelvic muscles including the cranial and caudal levator fasciae which cover the superior and inferior surfaces of the levator muscle and fuse as they

meet at the free border of this muscle; second, the tubular layers of fascia surrounding the bladder, vagina and rectum, *which* he states *are laid down as thin layers of connective tissue but are increased in thickness as the hollow organs surrounded by them change in size and position during functional or pathologic conditions;* third, the subserous connective tissue which forms a network underneath the peritoneum. This last structure through embrylogic, functional and pathologic changes in form and position of the pelvic organs, forms bands and planes of increased density. He ap-
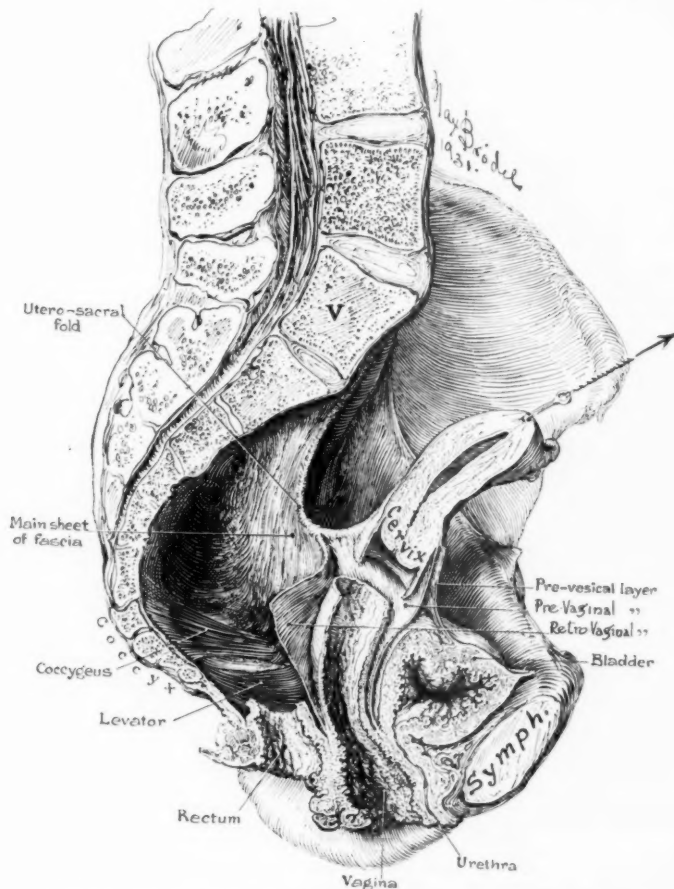
Fig. 1.*—Shows the manner in which main sheet arises from the pelvic floor forming the uterosacral fold in the dorsal part of the pelvis and separating to surround vagina ventrally. Part of the vagina is removed to better show the prevaginal layer. The retrovaginal layer extends higher on the cervix than is shown here.

plies the term *tela* to the broad planes thus formed and our particular interest lies in his tela endopelvina. This is a broad sheet of connective tissue which, he states, extends from the symphysis in a laterally convex curve to the ischial spine, from which it radiates toward the connective tissue on the anterior surface of the sacrum. ''The

*The illustrations consist of three drawings and six photographs made directly from the dissected pelvis, and one semidiagram. The camera has shown so much detail that it is difficult to understand the photographs without referring to the drawings. However, the photographs are used because of their authoritative reproduction. If the reader will view the photographs with one eye, a certain stereoscopic effect will be obtained.

whole expansive structure is accordingly, laterally convex and medially cut three times concave around the bladder, vagina and rectum.''

Cunningham[2] states that ''the dissector . . . . can convince himself that the visceral layer (of fascia) springs from the parietal layer immediately above the origin of the levator ani, and that, as it runs towards the medial plane, it encloses the pelvic viscera.''

Recently an histologic study of the pelvis of a young nullipara has been presented by Goff.[3] He states in his conclusions that there is a thin layer of fascia of areolar type between the anterior vaginal wall and the bladder and a similar layer of areolar fascia
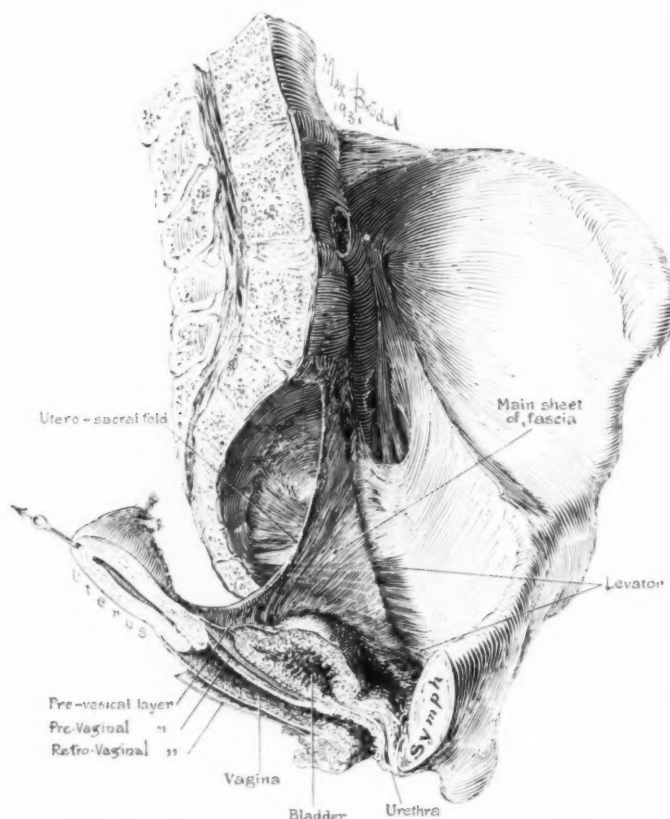
Fig. 2.—Shows the line of reflection of the main sheet running medial to and parallel with the origin of the levator muscle. Fibers of the levator show through the stretched main sheet.

between the posterior vaginal wall and the rectum. These layers, he continues, unite at the side of the vagina to form the perivaginal fascia which is a part of the fascia endopelvina. However, he states that the areolar character of this fascia makes it impossible to dissect it as an individual layer.

Clinical evidence of the existence of layers of fascia between the bladder and the vagina, and the vagina and rectum, is brought forth by Halban,[4] Frank,[5] Neel,[6] Rawls,[7] Clark[8] and others, and most pelvic surgeons have had experience in the use of these structures. My experience has been that the layers are thicker in proportion to the dislocation of the organ surrounded by them, which agrees with Tandler's statement that fascia surrounding the vagina increases with pathologic changes in position of
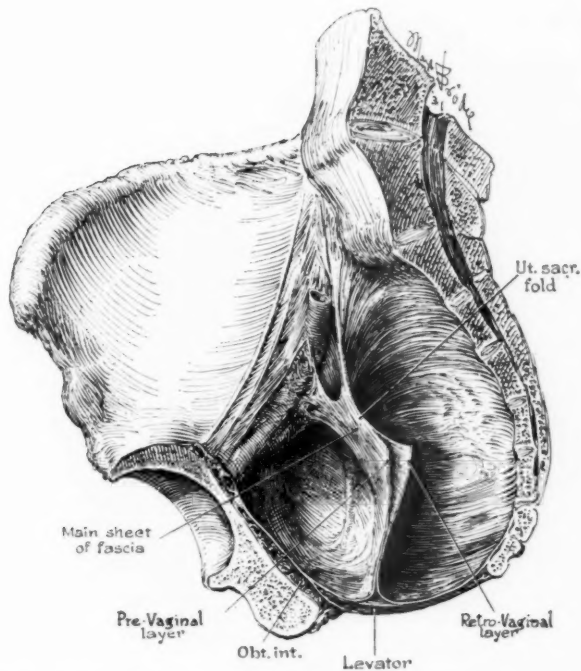
Fig. 3.—The right dorsal quarter of the pelvis. This shows the manner in which the superior levator fascia is reflected to form the two layers of the main sheet. The terms "prevaginal" and "retrovaginal" on the lateral and medial leaves respectively indicate the disposition of these layers as they reach the ventral part of the pelvis.
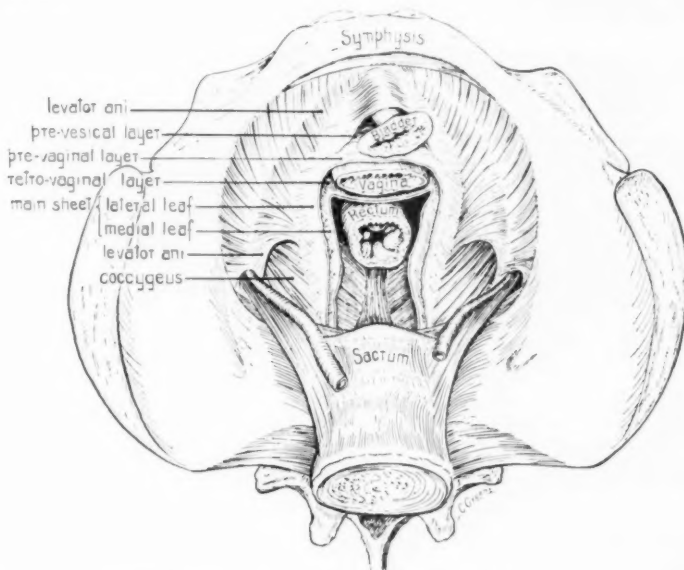
Fig. 4.—A semidiagram showing the two layers of the main sheet as they are reflected along the superior surface of the levator, and the manner in which they surround the vagina.

this organ. If these observations are true, the fact that Goff's subject was a nullipara may explain the areolar character of her fascia.

My study, which was begun in 1927, is based upon the dissection of four female pelves which agree in all major points. The illustrations were made from the third pelvis dissected because of its excellent state of preservation. In the following description the terms dorsal, ventral, cranial and caudal will be used in the recognized anatomical sense.
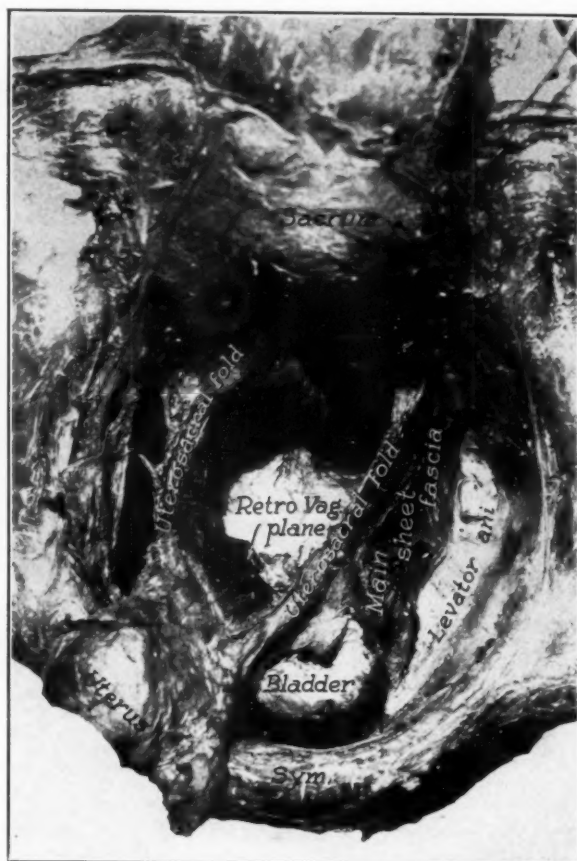
Fig. 5.—Photograph of pelvis from above. The two uterosacral folds are seen and the reflection of the main sheet from the levator. The arrow (center) points to an incision made in the retrovaginal layer to call attention to the manner in which it crosses behind the vagina. Uterus is pulled forward and to the right.

If one views the superior surface of the pelvic floor, it will be noted that on a line extending along the superior surface of the levator muscle, irregularly 1 to 2 cm. below the muscle origin at the white line, and irregularly parallel to it, the superior levator fascia is reflected cranially to form a free sheet of fascia (Figs. 2, 4, and 5). This line of reflection extends from the lateral portion of the inferior border of the body of the pubis back to a point just medial to the spine of the ischium. The base of

this reflected plane is attached to the pelvic aspect of tha pyriformis muscle dorsally as far as the middle of the great sacrosciatic foramen. Its dorsal border blends by means of loose areolar tissue with the fascia covering the pelvic aspect of the sacrum. This reflected free layer of connective tissue I have designated as the *main sheet* of the visceral pelvic fascia. This main sheet is composed of two layers, the lateral and medial leaves, which in the dorsal half of the pelvis are closely attached and rise cranially

Fig. 6.—Photograph of the right dorsal quarter of the pelvis. This shows the reflection of the two layers of the main sheet from the superior levator fascia. The words "prevaginal" and "retrovaginal," on the lateral and medial leaves respectively, indicate the disposition of these layers as they reach the ventral part of the pelvis.

5 to 6 cm. to form the uterosacral ligament (Figs. 3 and 6). Ventrally, at the lateral border of the cervix and vagina they separate to surround these organs (Figs. 1 and 4). As this separation takes place, the lateral leaf bends medially to become the prevaginal layer which lies ventral to the vagina, between this organ and the bladder, and extends as a broad sheet from a line crossing the cervix at the level of the internal os down to where
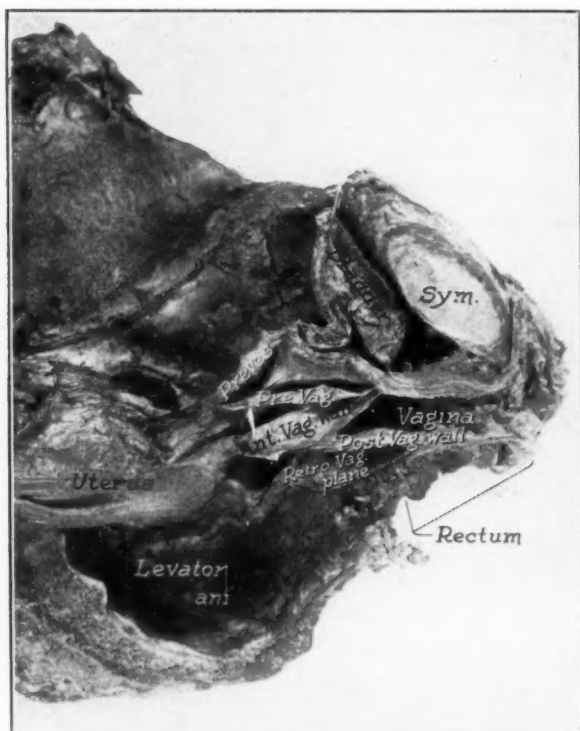
Fig. 7.—Photograph of left half of pelvis, showing relation of the pre- and retro-vaginal layers to the vagina. Uterus pulled back to the sacrum. Part of pre-vesical layer is also shown.
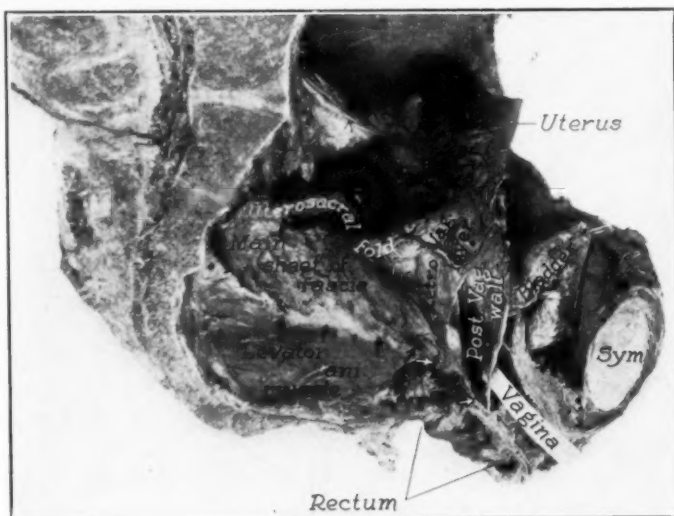
Fig. 8.—Photograph of the left half of pelvis. Here is shown the main sheet and manner in which the retrovaginal layer turns medially dorsal to the vagina. Note how it covers the dorsal aspect of the cervix. The arrows mark the reflection of medial leaf of the main sheet and the retrovaginal layer from the superior surface of the levator.

the vagina meets the urethra.   Below this it cannot be distinguished
(Figs. 1, 4, 7, and 10).

The medial leaf of the main sheet swings medially dorsal to the cervix
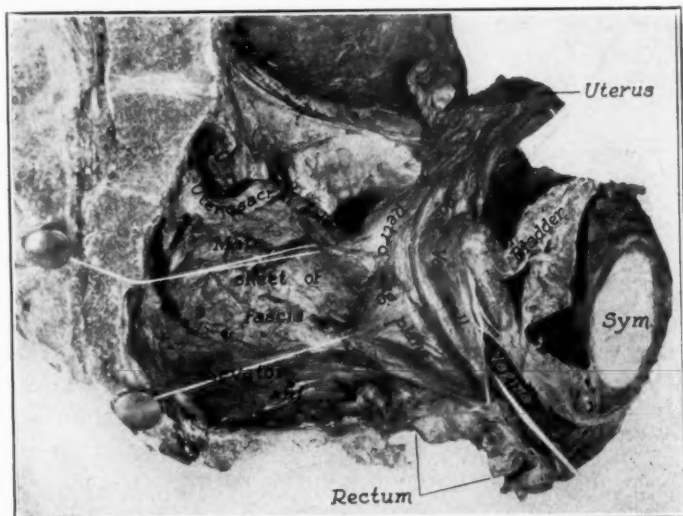
Fig. 9.—Same as Fig. 8 except that the retrovaginal layer is pulled back to show
better its breadth and its relation to the posterior vaginal wall.

Fig. 10.—Left half of pelvis, taken on the oblique to show the breadth of the
prevaginal layer.   Arrow indicates its upper attachment.   Note how it ends below
at the urethrovesical junction.

and vagina and becomes the retrovaginal layer, a broad sheet of fascia
taking its position between the rectum and vagina and extending from a
line crossing the dorsal aspect of the cervix at the level of the internal os

down to the surface of the levator where the vagina penetrates this muscle (Figs. 1, 4, 5, 8, and 9).

I have used the term main sheet of visceral fascia rather than the fascia endopelvina or tela endopelvina (Tandler) in order to emphasize the fact that this structure is the main sheet from which the prevaginal and retrovaginal layers are continuous.

It is seen, therefore, that my description agrees with those of Tandler, Cunningham and Goff that there are layers of connective tissue surrounding the vagina and that there is a broad sheet of fascia arising from the pelvic wall to extend medially and fuse with these layers. My dissections, however, show a much more definite relation between the layers surrounding the vagina and the so-called tela (fascia) endopelvina (main sheet).

There are two points I wish particularly to emphasize: first, that this whole structure is a double layer of fascia reflected from and continuous with the superior levator fascia; and second, that the layers surrounding the vagina are definite dissectable structures. The first point, to my knowledge, has not previously been made and is important since if it can be proved that the fascial layers surrounding the vagina are derived from the superior levator fascia, it can then be concluded that they are true fascia. The second point is important since it produces anatomical evidence to support the fact that such layers are found surgically.

CONCLUSIONS

Evidence is presented to show: that the vagina is surrounded by fascial layers, which are definite dissectable structures, attached to the pelvic floor by a broad main sheet, and that the whole structure is a continuous reflected layer from the superior levator fascia.

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505 MEDICAL ARTS BUILDING.

LYMPHATIC LEUCEMIA AND PREGNANCY

HOLLIS K. RUSSELL, M.D., VALHALLA, N. Y.

(From the Laboratory of Grasslands Hospital)

THE following case of chronic lymphatic leucemia complicated by pregnancy is reported because of the rarity of the condition, because of the large numbers of mitotic lymphoblasts in the maternal blood and the leucemoid character of the blood of the infant.

The patient was a native white woman of twenty-two years, married and the mother of two healthy children. She remembered no early illnesses and her family history was without record of value. She had been regular in her personal habits and in her menses. She had been married five years, each of her previous pregnancies had gone to full term and labor had been natural on each occasion. One year before her death she noticed that she fatigued easily and when, two months later, she failed to menstruate she also developed aching pains and edema in her legs. Shortly after, attacks of dizziness, headache, and blurring of vision appeared. All of these symptoms were much aggravated during the seventh month of pregnancy and nausea and vomiting at meal times were added symptoms. A month later her back ached so severely that she thought labor had started. She was seen by a physician at that time and pallor, intermittent fever, and weakness were noted. She was given bed rest for several days with considerable improvement. But shortly after labor started spontaneously, she delivered herself of a male infant three weeks before term. A large hemorrhage occurred during the third stage of labor. Added symptoms at this time were marked shortness of breath, pallor and generalized body pains, sweats and rigors.

The physical examination, made when she was admitted to Grasslands Hospital, mentions the patient's extreme pallor, buccal herpes, swollen, spongy, congested, and superficially ulcerated gingiva, a systolic thrill and murmur, a liver which appeared large and could be palpated 4 cm. below the costal border and an enlarged spleen. This organ extended nearly to the midline and to a level 2 cm. below the umbilicus inferiorly. There were scattered petechiae over the lower extremities. The blood pressure was 128/60. The eye grounds were stippled with many old and recent hemorrhages, the discs were scarcely distinguishable.

Examination of the blood showed the hemoglobin to be 3 gm. per 100 c.c. of blood or 18 per cent (Newcomer). There were 1,450,000 erythrocytes per c.cm., 0.25 per cent of which were reticulated. The leucocytes numbered 36,200, the platelets 70,000. Of the leucocytes 4 per cent were lymphoblasts, 6 per cent large lymphocytes, 12 per cent Reider type lymphocytes, 46 per cent lymphocytes of medium size and 31 per cent small lymphocytes. Myelocytes formed 2 per cent, metamyelocytes I 2 per cent, metamyelocytes II 2 per cent. An oxydase preparation showed but 10 cells in 200 to contain granules which react to that stain. The erythrocytes were abnormal in size, shape and staining qualities with many normoblasts present. Many subsequent examinations of the blood were made during the five weeks the patient lived. They are recorded in Table I.

Other examinations were made. Two blood cultures remained sterile for fourteen days, the blood Wassermann was negative, the urine was normal until some days later when albuminuria appeared. Roentgenographic examination of the chest showed no recognizable lesions.

The patient was given two transfusions of whole blood (600 c.c. and 500 c.c.), iron and ammonium citrate and x-ray radiation. Three doses of the latter were given, the

first on October 6 when one-eighth of an erythema dose was given, filtered through one aluminum and three-quarters copper filters, the second, four days later when one-tenth of an erythema dose was given through one-quarter aluminum and finally on October 13 when the second dose was repeated.

In addition to the changes in the blood which followed these treatments and which can be found in Table I, the patient felt much stronger and was more cheerful. But four weeks after her admission she began to fail, became progressively weaker and died one week later.
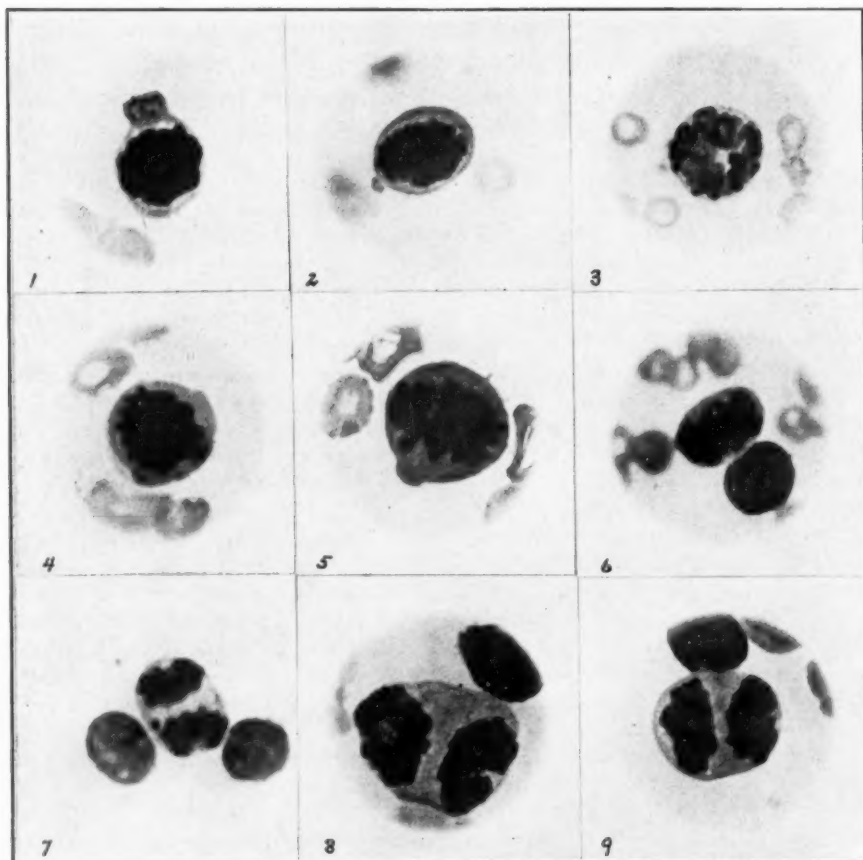
Fig. 1.—Lymphoblasts in mitotic division. Prophase: *1*, early spireme ("close spireme"); *2*, early spireme ("close spireme"); *3*, later spireme ("loose spireme"); *4*, monaster. Metaphase: *5*, amphiaster; *6*, beginning separation. Anaphase: *7*, early diaster; *8*, bipolar concentration; *9*, similar polar concentration. (Magnification ×1350.)

The postmortem examination revealed enlarged lymph nodes in the axillary, para-vertebral, and mesenteric groups, due to infiltration of the nodes with lymphocytic cells. The follicles and Peyer's patches of the intestines were markedly hyperplastic and infiltrated. The spleen weighed 550 gm., the liver weighed 2400 gm., both being infiltrated with similar cells. The kidneys weighed 300 gm. (right) and 275 gm. (left) and showed many tumor nodules of varying size, some of which measured 2 to 2½ cm. in diameter. These nodules involved not only the cortex but also the medullary tissue. Histologically they were composed of densely packed lymphocytic cells. Petechiae were

found in the skin of the abdomen and lower extremities, the pleural surfaces, epicardium, endocardium, and intestinal mucosa.

DISCUSSION

The present case is the sixth of lymphatic leucemia associated with gestation, but it is interesting to note that it is not only the first case in which a mother with lymphatic leucemia has become pregnant but also the first
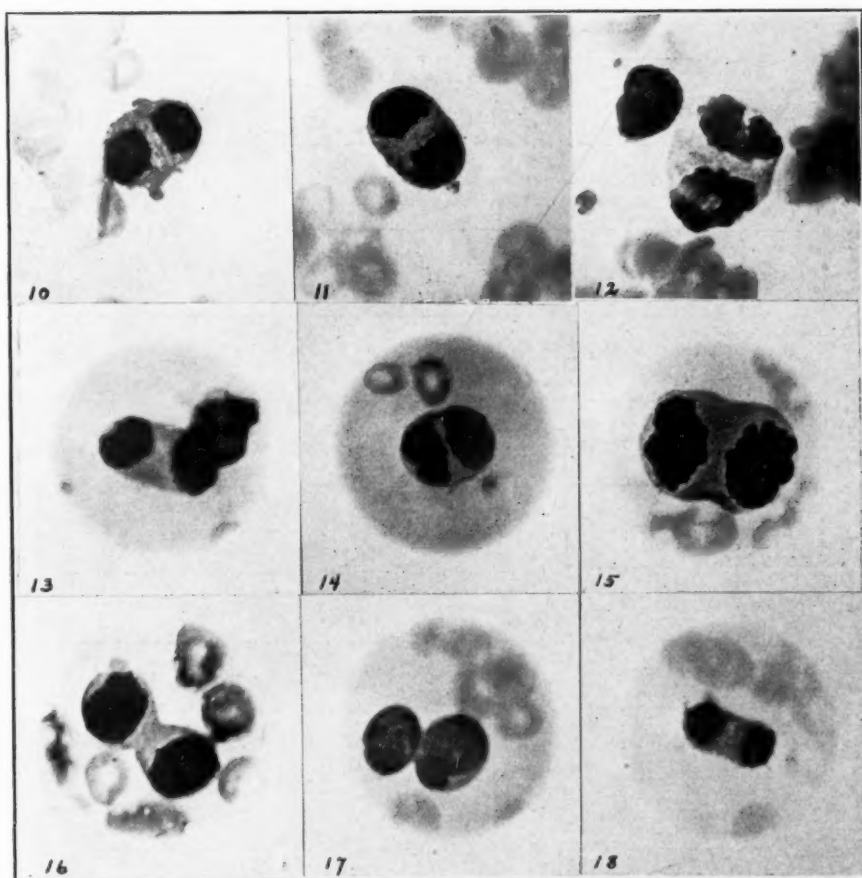
Fig. 2.—Lymphoblasts in mitotic division. Anaphase: *10*, late polar concentration; *11*, similar polar concentration; *12*, dispireme; *13*, late anaphase. Telephase: *14*, beginning equatorial constriction; *15*, well defined equatorial constriction; *16*, advanced separation of cytoplasm and bipolar concentration of chromosones; *17*, probable amitotic division; *18*, mitotic erythroblast. (Magnification ×1350.)

case of chronic lymphatic leucemia complicated by pregnancy. In general both forms of leucemia seem to be similarly influenced by pregnancy. Both are marked by a high rate of fetal mortality and by a tendency to a rapidly fatal outcome to the mother shortly after delivery. This consequence is especially true of the acute types of the disease.

Richter,[1] in studies on mouse leucemia, has shown that in these rodents

TABLE I

DATE	TOTAL WHITE BLOOD CELLS IN THOUSANDS	LYMPHOBLASTS	LARGE LYMPHOCYTES	MEDIUM LYMPHOCYTES	SMALL LYMPHOCYTES	MYELOCYTES	METAMYELOCYTE I	METAMYELOCYTE II	TRANSFUSIONS	RADIATION TREATMENTS	HGB. IN PER CENT (NEWCOMER)	GRAMS	ERYTHROCYTES IN MILLIONS	COLOR INDEX	RETICULOCYTE PER CENT	PLATELETS IN THOUSANDS	MITOSES
10- 3-31	36.2	4	6	58	31	2	2	2	600 c.c.	XAS*	18%	3	1.45	0.7	.25	70	occasional
10- 6-31	37.4										29	5	1.77			82.5	
10- 7-31	38.3	5	12	51	30	0	0	2							1.6		
10- 8-31	39.0	7	17	43	21	0	1	1		XPS* XAS*	24	4.1	1.91	0.64	2.1		
10- 9-31	40.0														3.3		
10-10-31	27.4	5	9	47	29	1	2	7			34	5.7	2.30	0.74	4.2		
10-13-31	30.6	9	16	40	28	0	0	7									
10-14-31	22.3																
10-15-31	27.7																
10-16-31	16.2	3	12	53	22	1	0	9		XM*							one in 500
10-17-31	22.1																
10-20-31	32.4																
10-21-31	21.5	11	19	41	21	1	1	6			32	5.4	1.76	0.94	3.2	69.2	
10-26-31	22.4												1.61				
10-27-31	25.2	14	13	50	18	1	1	3	500 c.c.								
10-28-31	51.7																
10-29-31	84.4	19	12	37	28	1	2	1									numerous
10-31-31	109.6	25	10	39	22	0	2	2									numerous
11- 3-31	110.8	36	7	33	21	1	2	0			11	1.9	0.91	0.61			numerous
11- 5-31	248.8																

*XAS—Radiation, anterior spleen; XPS—Radiation, posterior spleen; XM—mediastinum.

the disease is transmitted by a constitutional morbid diathesis. He has accomplished this by hereditary inbreeding. Riccitelli and Ragnotti[2] have collected a total of 15 reported cases of familial leucemia. They found that most of these cases belonged to the chronic lymphatic variety. They conclude that an hereditary organic substratum plays an essential rôle in the evolution of leucemia.
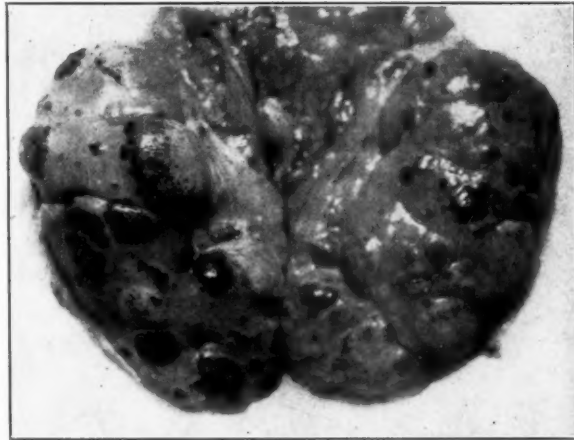
Fig. 3.—Leucemic nodules in kidneys.
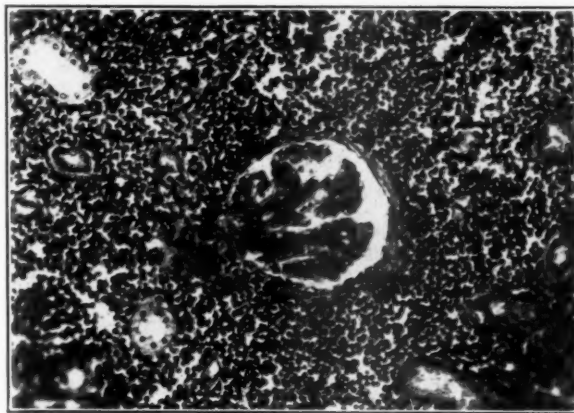
Fig. 4.—Microphotograph of kidney lesions.

The features in the present case which appear of greatest interest are the large number of mitotic cells in the maternal blood and the character of the infant's blood cells. Mitotic figures were very numerous during the last ten days of life and numbered, on numerous occasions, one mitosis in every 500 white blood cells.

The entire cycle of division is represented in these cells and in addition one example of amitotic division is presented. The nuclei of these cells

stain a purplish-red color; the cytoplasm has a dark bluish ground-glass appearance. In none of the mitotic cells were there any granules in the cytoplasm. A large number of authors have reported mitotic leucoblasts in leucemia, including Bowcock and Bishop,[3] Groat,[4] Bowcock and Dickson,[5] Robinovici,[6] and Tannhauser.[7] Dock[8] in 1904 after a thorough review lists twenty-nine authors who have contributed to the literature on mitosis in the circulating blood, the largest percentage occurring in the leucemias. However, numerous cases of severe anemia were reported with mitotic erythroblasts present.

In none of these cases has the incidence of mitosis been as great as in the present one, but none were associated with pregnancy. It may be that growth producing factors, the result of gestation, accelerate the generation of lymphoid cells.

A matter of possible significance is the abnormality of the infant's blood. At six weeks of age the erythrocytes numbered 3,610,000, the hemoglobin was 57 per cent (Newcomer), and the leucocytes were 17,100.

Differentiation of the leucocytes showed in each 100 cells: lymphoblasts 5 per cent, large lymphocytes 21 per cent, small lymphocytes 27 per cent, medium lymphocytes 29 per cent, metamyelocytes I 2 per cent, metamyelocytes II 4 per cent, mature neutrophiles 10 per cent, eosinophiles 2 per cent.

In the process of classifying these cells one mitotic lymphoblast was observed. The presence of many immature lymphocytic cells together with a definite anemia render this fetal reaction intensely interesting. Since the fetal and maternal blood cells are completely separated it is obvious that these abnormal and immature lymphoblasts and lymphocytes were formed in the infant. That these cells subsequently disappeared suggests they were the response to a maternal influence rather than a fixed characteristic of the infant. The maternal influence must have expressed itself through a filterable agent capable of entering the fetal circulation.

The nature of lymphatic leucemia has been believed to be either a unicentric neoplasm which, because of the character of the tissue involved, leant itself readily to multiple and widespread metastasis, or the multicentric response of lymphatic tissue to an acellular factor. The experimental study of leucemia suggests a filterable agent as the causative factor, and, while the disease in fowls and man may be quite different, the leucemoid reaction in the infant in this case is explained only on that thesis. It is regrettable that examination of the infant's blood was not made in many of the recorded cases of leucemia, for such a response may not be uncommon.

It is impossible to exclude a combination of two factors in this case, the presence of a filterable agent and a constitutional tendency in the infant. It is planned to follow the future course of the child.

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ORGANOTHERAPY OF MASTODYNIA*

ALEXANDER G. GABRIELIANZ, M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology of Rush Medical College of the University of Chicago)

UNTIL very recently our familiarity with the glands of internal secretion has been vague and often contained an admixture of fantasy. Our knowledge of endocrinology cannot be considered as having attained even the stage of adolescence. Nevertheless, daily, painstaking work in laboratories and clinics has gradually brought us to a state where, in some cases, palpable results have been attained. By administering the hormone we replace the function of an endocrine gland which has become hypoactive or inactive. In cases of insufficiency of the endocrine gland, temporary administration of the identical hormone by relieving and unloading the gland often leads the gland to a firm restoration of its function. It may also stimulate synergists to the administered hormone or bring the antagonists from hyperactivity to the normal function or, if administered in larger doses, make it hypoactive. It may also, by changing the equilibrium of the endocrine system, lead to increased secretion of one or the other of the hormones.

In this paper I shall discuss cases of mastodynia treated with ovarian residue, that is, follicular substance and interstitial gland of the ovary without corpus luteum, and treatment with female sex hormone.

CASE 1.—Mrs. L. B., twenty-six years of age, came to my office on June 17, 1931. She was married at nineteen, divorced after two years; had one living child, five years of age. First menstruation at fifteen; since then regular, three days' duration, four pads a day; no dysmenorrhea. In February, 1931, the patient noticed a painful lump in her

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right breast and later a smaller one in her left breast. The lumps had a tendency to enlarge and the patient feared cancer. The pain after menstruation disappeared and the lumps became smaller. The same enlargement and pain was noted in March, April, and May. Examination revealed small, palpable nodules, freely movable and slightly tender in the normal sized breasts. The uterus was retroflexed and retroverted. The patient was given 5 grains ovarian residue three times a day, fifteen days before menstruation. She was free from breast pain in July and the nodules had decreased in size. In August the patient had the same treatment. At present she is free from nodules in the breasts and pain.

CASE 2.—Miss R. N., aged thirty-nine years, came to my office on May 17, 1928. She was greatly alarmed because of swelling and pain in the breasts which she had noticed in March and April. After menstruation the pain disappeared and the swelling was markedly decreased. The patient feared that she had a cancer. Her menstrual periods had always been normal.

On examination tender nodules the size of a half fist were found in the breasts which were quite large and heavy; the skin was freely movable. I gave the patient a nerve tonic and advised her to see me in two weeks. When she returned her menses were over and I found no tenderness in the breasts and the nodules were markedly decreased in size. Then I asked the patient to visit me five more times at two week intervals and at the end of that time I disclosed the relation of swelling and pain to menstruation. Swelling and pain started twelve days before menstruation and disappeared after menstruation. In 1928 I was unable to help her, but I did convince her that she did not have a cancer.

I next saw the patient in December 27, 1931. At this time she had been married five months. She stated that her menstruation was regular and that swelling and pain in the breasts continued with the same regularity every month, although this had been much less marked during the last year. I gave her 5 grains of ovarian residue with instructions to take it for fifteen days, three times a day, before menstruation. In January, 1932, the nodules in the breasts were small and she had very little pain. In February the patient was free from breast pain for the first time in three years and she is well at present.

CASE 3.—Miss M. P., thirty-two years of age, complained of delayed menstruation, the periods occurring once in two and a half or three months and lasting six days. The flow the first three days was abundant and was scanty the last three days. She also complained of pain in the breasts two weeks prior to menstruation which has been present since she was fourteen years of age.

The patient was well developed; breasts were of normal size. Bimanual examination showed small anteflexed uterus, freely movable, smooth, not tender. Measured by sound it was 4 cm. in length; adnexa not palpable. Patient was sexually frigid.

The patient was given ovarian residue from July until the beginning of November, 1931, elsewhere, in the form of tablets three times a day and a subcutaneous injection of one ampule of ovarian residue twice a week. She was relieved of pain in the breasts only partially.

I started treatment with female sex hormone with the purpose of increasing the size of the uterus and shortening the intervals between menstruation. In several other patients with underdeveloped or infantile uterus, by the continuous use of female sex hormone in small doses, we have succeeded in making the uterus increase from one and a half to two and a half its original size in two to four months.

This patient menstruated on October 14. I started treatment the middle of November. She was given one tablet, 30 units, of female sex hormone daily and one ampule of the same hormone subcutaneously of 25 Allen-Doisy units every other day. The patient again menstruated on November 30 and the period lasted six days. The same treat-

ment was started the beginning of December. She menstruated on January 11, the period being of six days' duration. The same course of treatment was given in January. The patient menstruated from February 14 to 19. Since February 20 the patient has taken one tablet, 30 units, of female sex hormone and she menstruated in March from the seventh until the thirteenth. In March she was given subcutaneously Prolan in powder form, freshly dissolved, every other day. On the eighteenth of the same month the patient menstruated for the second time from the eighteenth to the twenty-third. From November until March the patient menstruated every month and was free from pain in the breasts.

CASE 4.—Mrs. P. L., twenty-four years of age, complained of amenorrhea and sterility. First menstruation occurred at the age of thirteen. Since then it was regular, occurring once a month, of four days' duration, and abundant until she was eighteen years of age when she married. After marriage she menstruated once every four to six months. In 1925 she had amenorrhea lasting seven months. The same year the patient had a curettage. After curettage menstruation came at shorter intervals, once in three or four months.

The patient was first seen in October, 1930. Menstruation had not occurred for about a year. I started treatment with "menformon" and the patient became pregnant. I regret that I did not submit the urine to the Zondek-Aschheim test, and because her uterus was larger than normal on the first examination, I did not think about pregnancy and continued the treatment. On January 8, 1931, the patient aborted at three months. It is possible that she aborted because of treatment with menformon during pregnancy. The patient was next seen in the summer of 1931. She was suffering from mastodynia and menstruation was occurring once in two or three months. The patient was given ovarian residue. She menstruated from September 4 to 8 and had no pain in the breasts. On the fifth of November epistaxis of one day's duration occurred. In December, 1931, I started injections of female sex hormone and one tablet once a day of the same hormone, 30 units, per os. After giving her six injections, remembering my previous experience, I decided to wait and see the results. In January the patient menstruated for seven days. She was again seen in March, at which time her uterus was enlarged to about a nine weeks' pregnancy and soft. She was last in my office on May 10 and was then four months pregnant.

CASE 5.—Mrs. C. V., twenty-seven years of age, complained of pain in the left lower abdomen and lumps and pain in the breasts for three to ten days before menstruation. This had been present for over three years. First menstruation occurred at the age of fourteen; periods occurred once a month, three days' duration, three pads a day. Patient had curettage in 1921 and 1923, for unknown reasons.

On bimanual examination November 25, 1931, the uterus was found small and freely movable; both adnexa were enlarged. For the last two years the patient had had hypomenorrhea. Her last menstrual period was November 14, 1931, and was one and a half days in duration. She was given 5 grains of ovarian residue, three times a day for fifteen days before menstruation. The patient menstruated from December 9 to 11; the breasts did not swell and were not painful. On December 29 she started taking tablets. Menstruation occurred on January 13, 1932, was of two days' duration and there was no swelling and no pain in the breasts.

CASE 6.—Mrs. M. D., eighteen years of age, was seen on Feb. 17, 1932. She complained of sterility, pain in the breasts, and dysmenorrhea since the first menstruation at the age of fourteen. She had been married two years. Pain in the breasts starts three days before menstruation and discontinues after menstruation. Before marriage the patient often missed her periods for a month or two. Since her marriage she has menstruated regularly.

The patient has a pelvis and hair growth on the genitalia of masculine type; labia

minora distended, flabby and bore sign of violent autoeroticism in past; uterus pathologically anteflexed and of normal size. Patient urinated ten to fifteen times a day; there were no signs of cystitis. Her adnexa were not palpable.

The patient took 5 grains of ovarian residue three times a day on February 17; this was discontinued during menstruation from February 18 to 20, and was taken nine days after menstruation ceased. In March the patient missed menstruation. On April 27 menstruation occurred, two days' duration, four pads a day; pain in the breasts was not relieved.

The patient had a slightly enlarged thyroid gland and had Marie's, von Graefe's, and Rosenbach's signs of hyperthyroidism. She was subject to emotions several times a week. Her husband used violence, accusing her of sterility and of religious difference.

CASE 7.—Mrs. G. A., twenty-eight years of age, complained of sterility and pain in the breasts; married eight years; first menstruation at the age of thirteen; three days' duration. Menstruation often delayed for three months before marriage. After marriage menstruation became more regular and during the last few years the patient menstruated every month, three to five days' duration, using two to three pads a day. Patient never was pregnant. In August, 1931, she developed pain in the breasts, three days before menstruation, and since then she has had pain in the breasts every month, occurring three days before menstruation and discontinuing after menstruation.

On examination the breasts were of normal size; uterus was infantile and both adnexa were not palpable. In January, 1932, I gave the patient eight injections of female sex hormone of 25 Allen-Doisy units, on alternate days. In January there was no pain in the breasts, but menstruation lasted one and a half days and was scanty. In February the patient had no pain before or during menstruation and menstruation was abundant and lasted five days.

CASE 8.—Mrs. L. M., thirty-six years of age, complained of swelling and pain in the breasts during the last six years, three days before menstruation, which discontinues after menstruation. Patient married eight years, never pregnant, never operated upon. First menstruation occurred at age of fourteen; since then periods occurred once a month, four to five days' duration, three pads a day, painful on the first day.

The patient presented a mastoptosis, with enlarged, hanging, flabby breasts, extending a little below the umbilicus. Gland tissue well developed. Nodules the size of walnuts were tender on pressure. Hair distribution was normal. Gynecologic examination was negative.

On July 8, 1931, the patient was given 5 grains of ovarian residue, with instructions to take it three times a day. She menstruated July 26 to 30 and for the first time in six years had very markedly decreased pain in the breasts. Same treatment was given in August. She menstruated from August 24 to 28; there were very small and soft nodules in the breasts and the pain completely absent. In September the patient had similar course of treatment. On September 26 patient had abundant menstruation and for the first time in twenty-two years menstruated nine days. She had no nodules and no pain in the breasts. Another four months' observation of the patient showed that she was free from discomfort in the breasts.

Max Cutler, in his article on "Painful Breasts," mentions that the swelling and pain in the breasts is due to epithelial hyperplasia and desquamation of the epithelium in the lactic ducts. This desquamated epithelium accumulates and distends the lactic ducts and acini. This was demonstrated in experimental work on animals fed with corpus luteum. Edgar Allen states that one cannot get complete mammary reaction with follicular hormone alone. It is corpus luteum hormone which enlarges the

mammary gland.   Recently C. W. Turner and A. H. Frank of the Dairy Department of the University of Missouri, induced in castrated male and female rabbits mammary gland development in which the ducts developed lobules containing large numbers of alveoli resembling the budding of leaves from the smaller branches.   This was done by the simultaneous injection of a corpus luteum extract and the estrus producing hormone. Rosenburg states that in corpus luteum lies the cause of stimulation to growth of mammary gland.   Extract of ovaries without corpus luteum has no stimulating effect.   Rosenburg implanted ovary including corpus luteum from the pregnant bitch to the virgin one and it caused the growth of mammary gland.

G. W. Corner, experimenting on rabbits, found that the administration to nonpregnant spayed rabbits of corpus luteum extract did not cause proliferation of the mammary gland beyond the stage normally present in puberty and that the administration of extract of whole sheep's hypophysis to spayed virgin rabbits caused proliferation of the mammary gland and lactation.   A. S. Parkes states that the luteal phase of corpus luteum in nonpregnant rabbits was prolonged to the length of true pregnancy with anterior pituitary extract.   This caused growth of mammary gland as in pregnancy and the author is of the opinion that no fetal factor is involved in the complete development of the mammary gland.

In Case 8 the patient was menstruating regularly for twenty-two years. When ovarian residue was administered the patient had menorrhagia. May we speculate that the administration of ovarian residue brought its antagonist, the corpus luteum, from over-activity to hypoactivity and decreased its luteinizing power.

The time of ovulation is considered to be fourteen to fifteen days after the first day of the last menstruation.

The studies of human corpus luteum by Chydenius and Malinovsky showed successiveness in the development of this gland.   Four stages of development of corpus luteum are known: Proliferation, vascularization, maturity and retrogression.   Edgar Allen states that when corpus luteum becomes yellow there is no hormone in it, and that the hormone is obtainable only in early corpus luteum.   Therefore, the hormone is available in the stages of proliferation and vascularization.   As to the time, Malinovsky states that proliferation takes place in the first day or two after rupturing of the follicles followed by vascularization.   The transition from the stage of vascularization to the stage of maturity is gradual. The most intensive functional activity of the cells of the corpus luteum is manifest in the first five to seven days of life.

In my 8 cases, in the reported 15 cases of Dr. Cutler and one case of Dr. Hardgrove (Mayo Clinic), the pain and nodules in the breasts were present at different times in relation to the menstruation.   This may be explained by menstrual disturbances in the majority of cases.

In the 8 patients treated, 5 were cured by administration of ovarian residue and two by the administration of female sex hormone. One of these two patients was partially relieved by taking ovarian residue orally and subcutaneously and cured after the administration of female sex hormone by mouth and subcutaneously. In one patient the pain in the breasts was not relieved.

In cases where only pain in the breast is present, it should be differentiated from intercostal neuralgia. If nodules are present, they should not be operated upon but treated, because of their nonmalignancy. Farrar says that a distinguished surgeon in this country had operated upon a hundred cases before he found that they were not cancerous, and he is now leaving them alone. George Ward, in discussing Farrar's paper, says that most operations sacrifice the gland bearing tissue which may be of value to that woman should she become pregnant later.

We conclude with the belief that the cause of mastodynia lies probably in over-activity of corpus luteum and that the primary cause of it is in hyperfunction of the anterior pituitary gland. It might be hypersecretion of Prolan B and normal secretion of Prolan A. Theoretically, hyposecretion of Prolan A and hypersecretion of Prolan B should lead to amenorrhea.

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25 EAST WASHINGTON STREET.

ABSTRACT OF DISCUSSION

DR. MAX CUTLER.—Several years ago I reported the first series of patients suffering from mastodynia treated with ovarian residue.

Upon reviewing the literature of the physiology of the breast, it was apparent that "painful breasts" were usually associated with a syndrome in which there is an excess of corpus luteum. It would seem as if in this condition the corpus luteum dominates the ovarian metabolism. The menstrual periods, for example, are usually short and scant, and the patients have pain in the breast at the menstrual period.

Because of the reciprocal relation between the corpus luteum and the follicular secretions of the ovary, it occurred to me that the syndrome of "painful breasts" might be associated with a hypofollicular function. On the basis of this theory I treated a series of patients with ovarian residue by mouth. There was striking improvement in many cases, but the results were not constant. During the last two years

I have treated these patients largely with subcutaneous injections of folliculin, and have found that the results are more constant and the effect usually more pronounced.

The control of the corpus luteum by the anterior pituitary gland is now well recognized, and I suspect that the disturbance in ovarian metabolism associated with "painful breasts" may be traced back to abnormalities originating in secretions in the anterior pituitary gland. Parkes of London has recently induced lactation in nonpregnant rabbits by injections of anterior pituitary preparations. The pathologic changes underlying "painful breasts" consist of a hyperplasia of the epithelium and also of the pericanalicular and periacinous connective tissue. The pain is probably caused by the distention of the ducts and acini by the epithelial debris resulting from the excessive hyperplasia. It is possible that edema may play a part in this condition. This state is usually termed "chronic mastitis" because lymphocytes are found throughout the tissues. Sir Lenthal Cheatle has repeatedly pointed out that this condition is not an inflammation but a hyperplasia, and suggested the term "mazoplasia" (hyperplasia of the breast) for this state.

DR. GABRIELIANZ (closing).—The relation of the anterior pituitary to the ovary may best be shown by an illustration of Dr. Zondek. After rupture of the follicle on the first and second day, the corpus luteum is not antagonistic to folliculin but it is synchronous with it, and only after the beginning of luteinization does the corpus luteum become antagonistic to the follicular hormone.

GRANULOSA CELL HYPERPLASIA OF THE OVARY

JOHN I. BREWER, M.D., AND HAROLD O. JONES, M.D., CHICAGO, ILL.

(From the Henry Baird Favill Laboratory and the Gynecological Service of St. Luke's Hospital)

ROKITANSKY in 1855 published the first account of granulosa cell hyperplasia of the ovary and believed, as many others have, that the growth was a tumor. Practically all writers have considered the granulosa cells as the essential constituents of these growths. The origin and the potential qualities of the growth, however, are disputed.

Two sources of origin have been proposed: (1) embryologic rests of germinal epithelium and (2) the granulosa cell layer of the follicles. The former has been sponsored mainly by R. Meyer whose conclusions were supported by Werdt, Neumann, and Davanzo. Schröder in 1901 was among the first to believe that the origin was in the granulosa cell layer of the follicles. Theca cells (TeLinde), Call-Exner bodies (King) and ova (V. Kahlden, Babes and Schröder) have been observed in the masses of cells. Walthart, Werdt and Meyer noted the similarity between the growths and the arrangement of the germinal epithelium in fetal ovaries. In fetal and mature ovaries of various animals Goodall observed persistent epithelial cells and in one a granulosa cell hyperplasia. Meyer, Habbe, Taussig and Robinson believed that an ovarian hormone was elaborated by the cells. Only Meyer and Rummelt have reported recurrences and metastasis, although many authors have regarded the growths malignant.

The following report is based on three patients in whom ovarian tissues with hyperplasia of granulosa cells were found. Two of these occurred in patients of one of us and the other was removed by Dr. Irving Stein, who submitted the tissues to Dr. E. R. LeCount for examination.

A woman, sixty-three years of age, was admitted to St. Luke's Hospital on October 17, 1930, complaining of occasional slight metrorrhagia; loss of fifteen pounds in weight, dyspnea and palpitation. A regular, twenty-eight-day, painless menstrual cycle began at the age of thirteen years; the menopause occurred at the age of forty-three years. She had never been pregnant. A soft tumor the size of a four months' pregnancy, not distinguishable from the uterus, was found in the pelvis. This was considered to be a malignant cystic tumor. On October 22, 1930, by laparotomy, we found that the right ovary was a cystic mass, approximately 14 cm. in diameter, extensively adherent to the bowel and peritoneum; the left ovary was slightly enlarged. The uterus was small and contained a fibromyoma. The uterus, both tubes, and ovaries were removed. The patient was discharged on the sixteenth day.

Gross Pathologic Description.—The thin-walled cyst, 14 by 14 by 11 cm. weighed 823 gm. Its surface was smooth and a slightly viscid opalescent liquid filled a large loculus. In the wall were a few small loculi and at one place a mass of
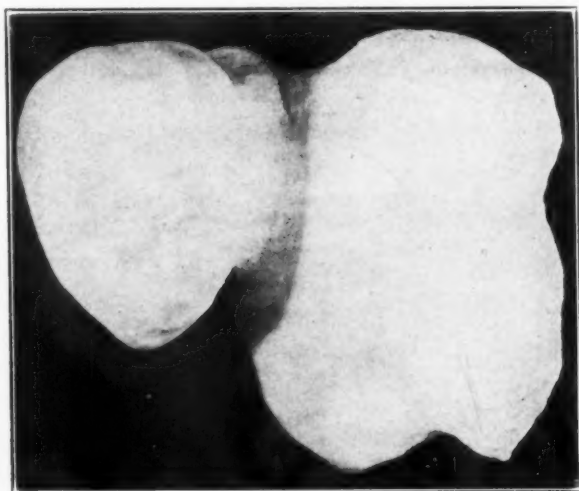
Fig. 1.—Photograph illustrating a three dimensional reconstruction of a granulosa cell mass.

solid tissue, 3 by 1.5 cm. This was fixed for examination in Zenker's solution and 10 per cent formalin. The left ovary was 5 by 3.5 by 3 cm. On surfaces made by cutting there were many smooth lined cysts, 2 cm. in diameter, with thick fibrous walls. Practically all of the ovarian tissue was replaced by cysts and trabeculae. The cysts contained a clear colorless, or faintly yellow fluid. The upper portion of the body of the uterus was 5 cm. long, 5 cm. wide, and 3.3 cm. thick. The peritoneum was roughened by torn fibrous adhesions. The cavum was 4.1 cm., its lining was reddened and thin and in the wall were several fibromyomas. The uterine muscle was soft and had very little of the fibrillar structures.

Histology.—The solid portion of the ovarian cyst had a dense ovarian stroma with bizarre islands and cords of epithelium comprising approximately 50 per cent of the solid tissue. These masses of cells in serial sections varied considerably in shape. Some were spherical, some cylindrical, and others had coarse finger-like projections. Following the suggestion of Dr. E. R. LeCount, three dimensional reconstructions were prepared from serial sections which revealed that these islands and cords had the general shape of follicles and were discrete (Fig. 1). Surrounding each cell mass was a definite connective tissue capsule. The cells composing them were

large cuboidal and oval epithelial cells. Those near the central portion were low, columnar or cuboidal, while those toward the periphery were oval or spindle-shaped. The cytoplasm was granular; their nuclei large and oval and their long axes extended in radial planes that converged toward the center. The nucleoli were distinct. The chromatin material was arranged in fine granules and threads. Only a few cells were observed in division. The cells had the structure and staining reactions of granulosa cells and were grouped radially around a center or around a cavity near the center of the cell mass. One cell mass had as many as ten cavities. In serial sections the cavities were oval and were not connected with each other (Fig. 2). The lining was regular and smooth. The contents of the cavities varied; some had a homogenous eosin staining mass, others had numerous small cells and a few had single large cells the size of and similar to ova (Fig. 3). The diameters of four of these large cells were 58.5, 58.5, 70.2, and 77.3 microns. Each had a large nucleus located in a slightly eccentric position and one contained a yolk nucleus. The diameters of the nuclei of the four cells were 19.5, 19.5, 19.5, and 25.0 microns. In
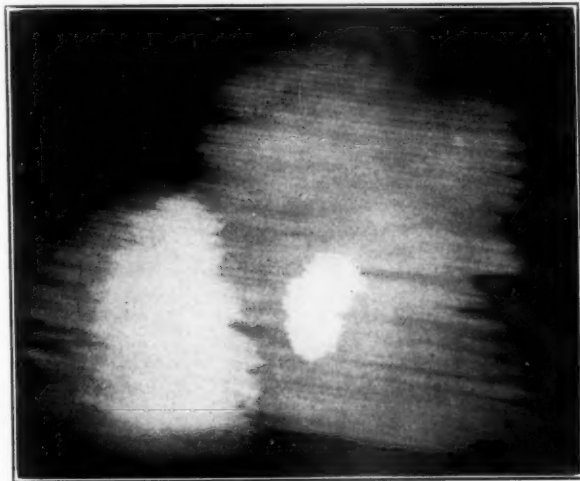
Fig. 2.—X-ray illustration of a cavity in a three dimensional reconstruction of a granulosa cell mass.

sections stained with Sudan III and osmic acid there were no lipins. Mitochondria were not found, probably because of delayed fixation. The large cyst was lined with a single layer of low columnar epithelium. Sections of the left ovary contained many cysts lined with single layers of columnar epithelium like a follicular cyst. The following diagnosis was made: granulosa cell hyperplasia and pseudomucinous cyst of the right ovary; follicular cysts of the left ovary. One year after operation the patient was in excellent health and had gained weight.

The second patient, aged fifty years, entered St. Luke's Hospital on November 18, 1931, because of irregular bleeding for one and a half years. The menopause occurred at forty-eight. At the age of eighteen she had noted an enlargement of the clitoris, a growth of hair on her body, face, and upper lip. These characteristics increased gradually and upon admission a definite rudimentary penis was present. Hair of male distribution covered her body and a moustache covered her upper lip. She had never been pregnant. Her menstrual periods were regular until after the menopause. Vaginal examination demonstrated an enlarged uterus and a firm freely movable mass 5 cm. in diameter in the right adnexa. The clinical diagnosis was a solid tumor of the right ovary; uterine fibromyomas. The excised uterus

contained several small fibromyomas. The right ovary was slightly enlarged; the left ovary was small. The patient made an uneventful recovery.

Gross Pathologic Description.—The uterus complete was 10 cm. long and 5.5 by 5 cm. between the horns. The length of the cavum above the internal os was 5.5 cm. The wall of the uterus was 1.5 cm. thick of which 1 to 2 cm. was endometrium.
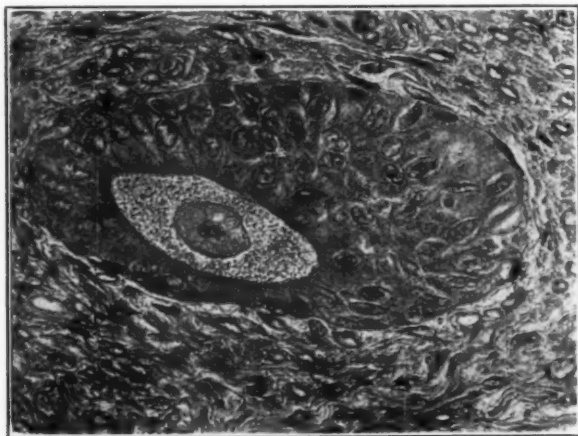
Fig. 3.—Photomicrograph of a section through a granulosa cell mass containing an ovum.
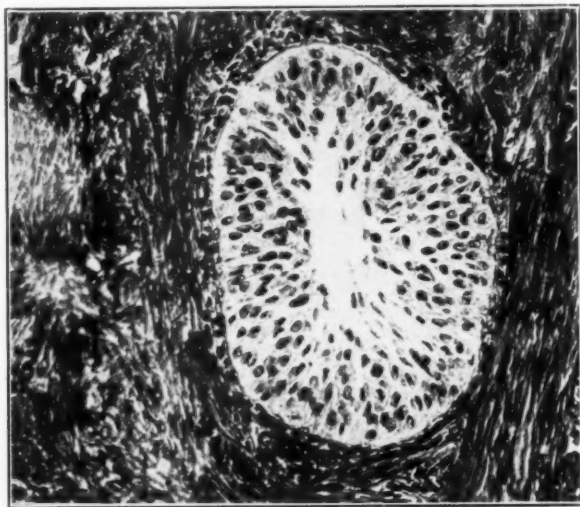
Fig. 4.—Photomicrograph of a section through a granulosa cell mass with theca interna cells surrounding it.

In the wall were 12 to 18 fibromyomas. In the cavity was a reddened polyp 2 cm. long. The lemon-yellow right ovary was 5 by 3 by 1.5 cm.; its peritoneum was smooth and glistening. On surfaces made by cutting there was a firm, spherical yellow-pink nodule 1 cm. in diameter in the medullary portion. It was separated sharply from the surrounding tissue by a distinct capsule. The tissues of this nodule were smooth and yellow-pink. The ovarian stroma about it was dense and contained a few small follicular cysts. The left ovary was 3 by 2 by 1.2 cm. Its peritoneal

surfaces were smooth. The ovarian stroma was dense, gray-pink and contained no follicles.

Histology.—In sections from the nodule were bands of dense fibrous tissue with bundles of smooth muscle fibers and scattered throughout were irregular masses of epithelial cells arranged in islands and cords. Each had a definite capsule and many had one or more cavities, the lining of which was smooth and regular and within them were eosin-stained masses of homogeneous material or numerous small well defined cells. The cells of these islands and cords resembled granulosa cells. They were large with clear vesicular oval nuclei whose long axes extended in radial planes from the center. A few were in mitosis. The cells bordering the cavities were cuboidal with distinct terminal bars. Surrounding the islands of cells was a deeply stained layer of connective tissue and closely grouped in a layer around some were cells that had the appearance of the theca interna (Fig. 4). In serial sections the islands and cords had finger-like projections, or extended as a single cord into the stroma. The cell masses were discrete; the general form was that of the follicles. In sections of the left ovary the stroma was dense and contained numerous corpora albicantia. The thickness of the endometrium in the plane of the sections was about 1 mm. The uterine glands were narrow and tubular and widely separated from each other. The stroma was dense and cellular. The diagnosis was granulosa cell hyperplasia of the right ovary; fibromyomas of the uterus and endometrial polyp.

The third patient (a patient of Dr. Irving Stein), thirty-four years of age, complained of severe metrorrhagia. Examination demonstrated a tender ovarian mass 5 cm. in diameter adherent to the apex of an old cervical tear. A cystic ovarian tumor 6 cm. in diameter was found adherent to the culdesac on the left side. Grossly it had the appearance of a hemorrhagic corpus luteum cyst.

Histology.—In the middle of the ovary beneath a corpus luteum cyst was a white nodule 0.5 cm. in diameter definitely circumscribed and composed of clusters of epithelial cells. These groups, or clusters, were round and oval and varied in size, some 1 mm. in diameter. The individual cells were uniform in size and shape. The cytoplasm stained faintly. The nuclei were centrally placed. Occasional cells in mitosis were seen. There was a suggestion of alveolar arrangement and in some of the spaces was a pink-stained material, but no ova. The epithelium did not invade the stroma. In one part of the tissues a few tubules were recognized which resembled remnants of wolffian duct structures. In serial sections these clusters were oval and elongated, or had finger-like projections. A diagnosis of granulosa cell hyperplasia of the ovary was made.

DISCUSSION

The origin of the growth of granulosa cells has been difficult to determine because the tissues have usually been bulky and the relations to the ovarian structures were distorted or destroyed. In approximately one-third of those reported there were other lesions, most frequently large cysts. Most of the information available has been obtained by the study of tissues with small growths. TeLinde found one of these in the medulla of an ovary and Meyer removed another outside of the ovary near the hilum. The one reported by Goodall was in the medulla near the rete ovarii and he concluded that this structure was the source. The rete, he believed, had its origin in germinal epithelium and he stated that it might persist at any place from the cortex of the ovary to the infundibulopelvic ligament. This conclusion may be correct because two of the growths recorded here were limited to the medulla.

In our specimens there was no hyperplasia of the granulosa cell layers of the follicles in the cortex nor any normal follicles in the medulla. There is, however, a distinct similarity between these growths and the arrangement of the germinal epithelium in the fetal ovary. In the fetal ovary the germinal epithelium extends from the surface into the stroma in broad masses. Cavities form and primordial follicles develop in them. As these grow each follicle separates from the cell mass by a constriction of the surrounding cells, in this way forming individual follicles. Meyer and Goodall have observed in ovaries of newborn, human adults and animals that these germinal epithelial cell masses do not form follicles but remain as undifferentiated cells in the stroma. Since these cells originate in germinal epithelium, they may assume a primordial function and form abortive follicles and ova.

The factors favoring an origin in embryologic rests of germinal epithelium are: the growths and fetal ovaries are similar; they occur in the medulla and in areas outside the ovary where there are normally no follicles; there was no hyperplasia of the follicular cells in the cortex; and abortive types of follicles and ova were present.

Many authors deny the presence of follicles in these growths because they have been unable to demonstrate ova. Ova have been described in the follicle-shaped masses by Babes and Schröder. In the first growth reported here there were abortive types of follicles and ova. Those observed by Babs and the ones described here had the characteristics and size of primordial ova. The epithelial cell masses had the shape of follicles and Babes illustrated ova surrounded by a single layer of these cells. The cells in the three presented here were many layers thick but maintained the shape of follicles. These cells were similar to granulosa cells and theca cells were arranged in a layer around the periphery in one of them. TeLinde also noted this in his tissues. We are certain that these structures are follicles because these cells are similar to granulosa cells, are arranged in follicles, contain ova and are surrounded by theca cells.

Many investigators stated that a hormone is produced in these growths. In the three reported here there was uterine bleeding, although two were beyond the menopause. In one the endometrium was polypoid and in another the opposite ovary contained many simple follicular cysts. In patients with similar growths Meyer noted hyperplasia of the endometrium and uterine bleeding after the menopause and Habbe observed a development of the breasts. Such physiologic changes indicate the presence of a hormone.

The growths reported here are probably benign, although many authors considered similar structures malignant on account of uterine bleeding and the arrangement of the cell masses. Metastases were not found in any of these three patients nor have any recurrences been observed. Although the individual masses were arranged in a bizarre pat-

tern, they were discrete, each having a definite limiting membrane, and there was no invasion of the ovarian stroma beyond the limits of the small nodules. These masses in a way are comparable to the glandular units in a benign hyperplasia of the prostate. This similarity leads to the conclusion that these cell masses are a hyperplasia of the granulosa cells and not a true tumor.

CONCLUSIONS

(1) The origin is in embryologic rests of germinal epithelium. (2) Follicles and ova are present. (3) A hormone is produced by these cell masses. (4) The growths are probably benign. (5) They are hyperplasia of granulosa cells and not a true tumor formation.

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104 SOUTH MICHIGAN AVENUE.

SMALL DOSES OF X-RAY FOR AMENORRHEA AND STERILITY

LOUIS EDEIKEN, M.D., PHILADELPHIA, PA.

(Attending Roentgenologist, Mt. Sinai Hospital)

NORMAL menstruation depends largely upon the proper activity and balance of certain of the endocrine glands. The ovaries, pituitary, thyroid, and adrenal are all concerned; and of these the ovaries and pituitary are the most important. It has been shown experimentally and clinically by Smith, Aschheim and Zondek, and others that ovarian function is largely dependent upon the stimulating action of the hormones of the anterior lobe of the pituitary body. Hypoactivity or dysfunction of the ovaries or pituitary may manifest itself in a disturbance of the rhythm or quantity of the normal menstrual flow. This may result in absent, delayed, or scanty menstruation or on the other hand in too frequent or excessive menstruation. Sterility may be associated with any of these. When no pathologic lesions in the pelvis or systemic diseases such as tuberculosis and anemia can be found to account for the ovarian dysfunction, then it is

said to be of functional or endocrine origin. It is only in this form of ovarian dysfunction that the so-called low dosage irradiation is applicable.

Van de Velden in 1915 recommended small doses of x-ray applied over the ovaries for functional amenorrhea. By this method of treatment he was able to establish the normal menstrual cycle. He also observed that some of the patients subsequently became pregnant. Later Werner and Ligner found that hypophyseal stimulation by x-ray produced similar results. Since then Opitz, Fraenkel, Flatau, Thaler, Doderlein, Hirsch, Rubin, Rongy, Kaplan, Drips and Ford, and others have reported series of cases of amenorrhea and sterility in which good results were obtained by x-ray therapy.

Despite these favorable reports, x-ray therapy for ovarian dysfunction has not received the recognition it deserves. I believe with Kaplan that this is due in a large measure to the prevalence of the opinion that x-ray therapy, particularly in gynecologic conditions, is used only as a destructive agent, either depressing or abolishing ovarian function. This is only true if large doses are used. On the contrary, small doses increase ovarian function.

Geller and Schught and others have shown that small doses of x-ray did not produce any degenerative changes in the ovaries of animals. Clinically, little opportunity arises to obtain specimens of human ovaries that have received these small doses of x-ray for ovarian dysfunction. The only observations along these lines were by Wagner and Schoenhoff. They selected young women for whom panhysterectomy was planned because of early carcinoma and applied 5 to 10 per cent S. E. D. to one ovary and carefully protected the other ovary. At operation within two weeks following irradiation, specimens of both ovaries were obtained. The histologic picture in the irradiated ovary was exactly like that of the control ovary. There was no evidence of degenerative effects as a result of the low dosage irradiation.

Is there any effect of this form of treatment upon the fetus or offspring if pregnancy should follow? This fear is based on the work of Murphy who showed that massive x-ray treatment during pregnancy may lead to fetal abnormality and destruction. However, this does not hold in the small doses of x-ray given for amenorrhea, because only small doses and not massive doses are used, and this form of treatment is not given during pregnancy.

It is the consensus of opinion that these small doses of x-ray, when properly administered, will not produce unfavorable effects upon either the patient or offspring.

MODE OF ACTION

The theories of the mode of action, of these small doses of x-ray, are numerous, widely divergent, and contradictory. A review of the literature convinces one that any explanation is purely theoretical, as the biologic effect of these small doses of x-ray on the pituitary body and ovaries in the human female is difficult of determination and as yet unknown. Most of the deductions have been made from the knowledge of the general

action of the x-rays, study of their effect upon plant and animal life, and clinical observations.

All the theories can be divided into two main groups: (1) stimulation, and (2) selective destructive action.

1. *Stimulation.*—A misunderstanding of the term stimulation may account for many of the differences of opinion and also for some opposition to this theory.

Bayliss says that all living protoplasm is capable of being affected by external forces. When there is a stopping or decreasing of its activity, it is known as inhibition; when a setting into action or increasing of activity occurs, it is known as stimulation. The agent that produces the excitation or stimulation is known as the stimulus.

This stimulation may be in growth or in function; it may be direct or indirect.

Martius says that any change in the living reactions of the cell is a stimulation. If stimulation is too strong, death ensues; if weak, an actual increase in cell activity may occur. By direct stimulation we mean that the action of the stimulus has been directly upon the cellular elements. According to Schwarz this can be explained by (1) increase of reversible cell permeability or (2) a rearrangement of electrons, atoms, and molecules causing the formation of a protein substance which he calls actinin. Because this body is derived from the cell substance its primary toxic action (not being foreign to the body) is not, according to immunobiologic laws, a great one. Of greater toxicity is its end products, the accumulation of which in small concentration causes stimulation of cellular activity.

A biologic basis for this direct stimulation theory is the Arndt-Schulz law. When applied to irradiation, it states that small doses of x-ray stimulate, moderate doses inhibit, and large doses destroy vital processes.

The possibility of a stimulating action of the roentgen rays was first brought to the attention of roentgenologists in 1910-11 by Cheroen, Duvel, Kronig, Seitz and Wintz. They warned that doses under 110 per cent S. E. D. caused carcinoma of the uterus to grow faster and increased the occurrence of metastasis. This view was shown, later, to be erroneous. However, it stimulated experimental work upon plant and animal life, as well as clinical application, in an attempt to prove that small doses of x-ray can increase function and growth. F. Weber produced premature development of buds; Von Hoffman showed that small doses of x-ray caused faster development of frogs' eggs. Hastings, Bekton and Wood found the quicker appearance of the silkworm after the eggs had been irradiated; Bohn claimed to have been able to cause parthenogenetic development of the sea urchin by irradiation.

Clinically, Stephan has been able to increase the coagulability of the blood in purpura by small doses of x-ray over the spleen. He explained this by direct stimulation of this organ, with increase of the secretion of the reticular cells, which are the mother cells of the fibrin ferment.

Stephan also claimed that irradiation of the kidneys, in oliguria or anuria during acute nephritis, would result in diuresis. He believed this to be due to direct stimulation of the depressed secretory epithelium of the kidney.

It was not until 1915 that Van de Velden reported the return of normal ovarian function after small doses of x-ray applied over the ovaries. Opitz, Flatau, H. Thaler, Fraenkel, Seitz and Wintz followed with similar results. Among these Opitz, Flatau, Fraenkel, Seitz and Wintz believed that it was due to direct stimulation.

All this experimental work and clinical observation seemed to point to a direct stimulating action of the small doses of x-ray.

However, Holzknecht, Pordes and others deny any stimulating effect, claiming that x-rays are always destructive in no matter what dosage and that the Arndt-Schulz law cannot be applied to irradiation.

Schwarz, Czepa and others, in reviewing and repeating some of the experiments pur-

porting to show stimulation by small doses in plant life, came to the conclusion that the data is partially erroneous and insufficient to prove direct stimulation.

It is this belief that x-rays do not have a direct stimulating action that has resulted in the opposition to direct stimulation of the ovaries as the reason for the return of normal ovarian function in amenorrhea. However, Schwarz, a milder opponent of the direct stimulation theory says, ''I believe we cannot say, a priori, that there is never a direct stimulating influence of x-rays on any object, just because it has not been conclusively proved. The most that can be said is that the proof is lacking.''

2. *Indirect Stimulation.*—By this is meant that the increase in function is secondary to a primary effect on other processes or tissue. It may be due to (a) the production of an active hyperemia causing an increase blood supply resulting in increased activity (Schwarz); or (b) to distant stimulation. For example, Werner, Ligner, Sahler and Borak have shown that small doses of x-ray applied over the pituitary body for amenorrhea has resulted in the return of normal ovarian function. I have had two patients with amenorrhea who have had a return of normal ovarian function after the application of small doses of x-ray to the pituitary body only. This, I believe, is added clinical proof of the relationship of the hypophysis to ovarian function.

The theory of selective destructive action with release of some check on the normal cyclical activity of the ovary is based on observations of Eymer and others that the component parts of the ovary display a varied radiosensitivity. The large follicles are more sensitive than the primordial follicles and the corpora lutea are the most resistant. Based upon the assumption that this is correct, Lenke, Borak, Gellert and others believe that this destructive action is on an abnormal large graafian follicle which is very radiosensitive and easily destroyed by small doses of x-ray without any degenerative effect upon the primordial follicles or corpus luteum. Upon the elimination of this follicle a normal one is permitted to mature, reestablishing the menstrual cycle.

Schwarz says this theory sounds plausible but does not change the fact that there is stimulation of ovarian function.

Another group contends that the small doses of x-ray destroy a persistent pathologic corpus luteum. However, as the corpus luteum is far more resistant than the primordial and mature follicles, it must necessarily follow that if sufficient irradiation is used to destroy a persistent corpus luteum then the mature and primordial follicles would also be destroyed with the result that there would be either a temporary or permanent loss of ovarian function.

Regardless of mode of action, whether direct or indirect, whether stimulating or selective destructive, there is no doubt that small doses of x-ray applied over the pituitary body and ovaries do stimulate ovarian function.

I have used small doses of x-ray to the ovaries and pituitary body in 56 cases of functional amenorrhea. There was an associated sterility in 33.

The following plan of treatment and technic has given me the best results. Two treatments are given weekly at intervals of three days. The first is given over the anterior pelvis through a field large enough to include both ovaries. The second is given over the pituitary body through a small field. The central ray enters just above and posterior to the mid point of a line drawn between the outer canthus to the external auditory canal. These treatments are continued for three weeks. In the patient of average size, the technical factors are 127 K. V., 5 M. A., 14 inch distance, 5 M. M. aluminum filter for three to five minutes. This is equivalent to $7\frac{1}{2}$ to $12\frac{1}{2}$ per cent S. E. D. or 50 to 80 R units. This dosage is varied according to the size of the abdomen and the thickness of the abdominal wall.

The results obtained with the above method of treatment in my series of 56 patients were as follows:

Amenorrheic patients   56
Return of normal menstruation   40

If a favorable response to these treatments is obtained, menstruation returns within six weeks to be followed by normal menstrual cycle.

In this group of successful cases, two patients received irradiation of the pituitary body alone and two the ovaries alone. The remainder received x-ray treatment over both the pituitary and ovaries. Where one alone was irradiated only three treatments were given at weekly intervals.

The longest period of amenorrhea in which a successful result was obtained was three years. It would seem from this series of cases that the length of the amenorrhea has no bearing upon the prognosis. In two patients a favorable response was obtained only after the second course. In one patient menstruation was reestablished after the first course of treatment to the ovaries alone. Normal menstruation occurred for six months and then followed a four months' period of amenorrhea. Another course was given and the normal menstrual cycle reestablished for eight months with another period of amenorrhea. A third course of treatment was given with a return of normal menstruation. A follow-up one year later showed that the menstrual cycle is still normal. Similar results were experienced in two other patients in whom both the ovaries and pituitary body were irradiated.

The results in the cases of sterility associated with amenorrhea were as follows:

Sterility patients   33
Total pregnancies   15 (in 14 patients)
Delivered of normal children   11
Premature delivery at seven and one-half
    months. Infant normal. Developed pneu-
    monia and died in six days   1
Pregnant but not delivered   3

In addition there are eight more who have had a return of normal menstruation but have not become pregnant. The possibility of pregnancy in these patients is greatly enhanced by the return of normal ovarian function.

In this group of 14 patients, one received irradiation to the ovaries alone and all others received treatment to both the pituitary and the ovaries. If a successful result is to be obtained conception takes place either immediately or not for some time after irradiation. In one patient pregnancy occurred during the course of treatment. This patient received two previous courses of irradiation. The first resulted in a return of the normal menstrual cycle only to be followed six months later by another period of amenorrhea. Irradiation was again resorted to with a favorable response. Menstrual periods were normal for another six months followed by an-

other period of amenorrhea. Pelvic examination revealed an infantile uterus with no evidence of pregnancy. At the patient's request a third course was instituted. Toward the end of this course of treatments the patient complained of nausea and vomiting. Menstruation did not return. At the end of six weeks pelvic examination showed the uterus to be larger than on the previous examination and a tentative diagnosis of pregnancy was made. Subsequent examinations confirmed this diagnosis. The patient was delivered of a normal child nine months following the third course of treatment.

In our successful patients the ages ranged from twenty-two to thirty-four. The period of sterility was as follows: 5, three years; 3, four years; 2, five years; 1, eight years; 1, nine years (this one has had two children since treatment) ; 1, ten years; and 1, eighteen years. The latter is the one who was delivered prematurely.

There were 16 patients with amenorrhea who did not respond to this form of treatment. A review of these cases failed to disclose a satisfactory explanation for the failure. In 2, treatments were given to the pituitary body alone. The others received treatment both to the pituitary and the ovaries. Nine patients received one course; 2, two courses; and 1, three courses of irradiation. We now believe that if the first course of treatment is unsuccessful, it should be repeated at the end of two months. However, before the second course is administered, one must be certain that pregnancy has not occurred, since this may account for the continued amenorrhea.

CONCLUSIONS

1. Small doses of x-ray directed to the pituitary gland and ovaries are of proved value in patients with functional amenorrhea.

2. It is also of definite value in properly selected cases of female sterility.

3. Before irradiation is undertaken all pathologic lesions in the pelvis, which may be a possible cause of amenorrhea or sterility, must be excluded by a competent gynecologic examination.

4. This form of treatment is not attended by any reaction or discomfort to the patient, and when properly administered has no ill effects upon the patients or the subsequent offspring.

5. To obtain the most satisfactory results, cooperation is essential between the gynecologist and radiologist.

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1832 SPRUCE STREET.

TUBULAR ADENOMA (ARRHENOBLASTOMA) OF THE OVARY

FRANK SPIELMAN, M.D., NEW YORK, N. Y.

(From the Gynecological Service and the Laboratories of the Mt. Sinai Hospital, and from the Department of Pathology of the Lincoln Hospital)

TUBULAR adenoma is a newgrowth, epithelial in nature, and showing a characteristic microscopic picture. The tumor has been described in males, the first reference to it being by Langhans[1] who in 1897 found it in the male gonad. In the ovary tubular adenoma is extremely rare, only 24 cases having been identified thus far. Pick[2, 3] in 1905 described the first case and noted the striking similarity of the histologic findings to that of adenomatous areas in the testicle of a male pseudohermaphrodite (Unger[4]). He accordingly interpreted his tumor of the ovary as having arisen from atrophic misplaced testicular tissue, and called it tubular adenoma testiculare. Schickele,[5] Blair Bell,[6, 7] H. O. Neumann,[8, 9] Berner[10] and E. Strassman[11] have since reported similar tumors. Moots[12] described the only case to be found in the American literature as a fibrosarcoma with pseudotubular formation on an ovotesticular basis. The most extensive studies on the nature and interpretation of these tumors have been made by R. Meyer who has himself added 8 cases and collected or correctly interpreted 9 more, 6 of which were referred to him by others.[13, 14, 15, 16, 17, 18, 19] He has also grouped the cases on a correlated morphologic and clinical basis,[14, 15, 16] dividing them into 3 classes. First, tumors having a regular and typical tubular microscopic arrangement; in this group 9 cases have been reported. Second, a group comprising 11 cases showing an irregular or atypical arrangement of tubules even to the absence of definite tubular structures, these being replaced by irregular epithelial cords. Third, an intermediate group showing both the typical and atypical features of the above 2 groups, totalling 6 cases. All 11 cases of the atypical group are associated with a masculinization of the female, i. e., a change in sexual characteristics as evidenced by hypertrichosis, deepening of the voice, coarsening of the features, increase in size of the clitoris, amenorrhea, loss of breast tissue, and other changes. The intermediate group usually shows only a mild degree of masculinization, amenorrhea alone or combined with a change in the quality of the voice.[16, 17] The typical group comprises 9 cases, only 3 of which showed any degree of masculinization. In the main, this group is not associated with changes in the sexual characteristics of the individual. In view of the overwhelming preponderance of cases showing masculinization R. Meyer has proposed the term "arrhenoblastoma,"[18] from *arrhenos* meaning male, to include all of the tubular adenomas not only because of the masculinization, but also because it suggests an origin from a definitely male-directed element. That the tumor is definitely associated with changes in sexual character-

istics is brought out by the fact that in every case there has been a regression of masculinization after its removal. The term "arrhenoblastoma" of R. Meyer is here adopted and the following case added to those already reported.

REPORT OF CASE

Y. K., aged twenty-six, married, reported to the gynecological clinic of the Mt. Sinai Hospital in November, 1926, complaining of amenorrhea and a profuse growth of hair on face and body. Her past history was essentially negative. She was born in Austria, and previous to her arrival in this country in 1921, her periods had been regular and normal. Since that time she had menstruated infrequently, had been amenorrheic for two years, and after her marriage two years before presenting herself at the clinic, had bled

Fig. 1.   Fig. 2.

Fig. 1.—Photograph of the patient showing the marked hirsuties of face and chest as well as the coarsening of the features.
Fig. 2.—Illustrating the small breasts.

scantily 2 or 3 times at six month intervals. She had never been gravid. On examination she showed marked hirsuties of face, chest, abdomen and thighs, the male escutcheon, and small flat breasts (Figs. 1 and 2). Pelvic examination revealed a clitoris 4 cm. long with a distinct glans, normally placed urethra, small labia minora, and normal vagina. The uterus was enlarged, globular and retroposed. There were no pelvic masses on repeated examination. Basal metabolism was −12 per cent, Wassermann negative and sella turcica by x-ray normal in size. Female sex hormone blood studies were made by Drs. R. T. Frank and M. A. Goldberger, and showed almost complete absence of cycle. She was treated with sex hormone preparations until May, 1927, without lasting effect. As she subsequently failed to report to the clinic, she was lost sight of. In October, 1929, she was brought into the Lincoln Hospital, in a comatose condition, cyanotic, bleeding from the nose and mouth, and showing the typical picture of a cerebral hemorrhage. There was a left hemiplegia, and her blood pressure was 160/90. She died three and one-half hours after admission. The autopsy revealed basilar hemorrhages in the brain, cardiac hypertrophy, chronic passive congestion of liver and spleen, a broncho-

pneumonia of both upper lobes, arterio-arteriolosclerotic kidneys, and marked general hypertrichosis. The pelvic organs consisted of a small infantile uterus, the cervix of which was long and conical, normal tubes and a normal left ovary. The right ovary was the seat of a tumor measuring 9.5 by 6 by 4.5 cm. Its surface is smooth, color grey and consistency firm. On section it is seen to be composed of fibrous tissue, greyish white in color, interspersed with irregular yellowish lobulated areas. Near the hilum several
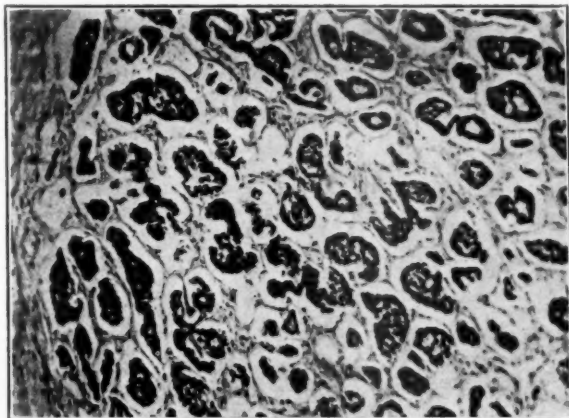
Fig. 3.—Low power. Shows tubular adenomatous arrangement of epithelial cells. Irregular cords can easily be seen. Because of this arrangement, the tumor may be put into the intermediate class.
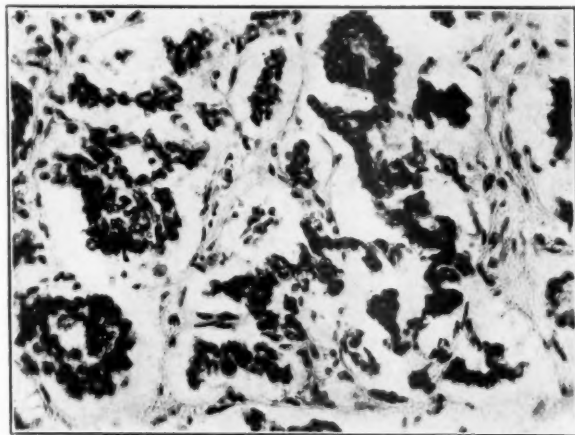
Fig. 4.—High power. The cells are seen to be heaped up and encroach upon the lumen. The tubular structure as well as the irregular cords are illustrated.

small cysts, none larger than 0.5 cm. are present. The smooth surface envelope is fibrous and encloses the tumor in the form of a capsule. Microscopically (Figs. 3 and 4), the tumor is seen to be composed of islands of epithelial cells in the form of lobules separated from each other by strands of connective tissue. The connective tissue dips into the lobules and appears between the epithelial cell groups. The epithelial cells have an irregular tubular arrangement in some areas and in others are in the form of cords. The cells vary from high columnar to cuboidal in type, and are often heaped up to encroach upon the lumen, even occluding them. The blood vessels show a perivascular lymphocytic infiltration. Ovarian tissue is nowhere recognizable.

That the tumor is a tubular adenoma, or arrhenoblastoma, can readily be seen. According to R. Meyer's classification[16] it falls into the intermediate group.* The pseudotubular arrangement, as well as the irregular cords, correspond almost exactly with most of the cases reported. Unfortunately, the tumor was not recognized during the life of the individual, so that its removal with the expected subsequent regression of male secondary sexual characteristics could not further prove its nature on a clinical basis. However, the striking gross and microscopic picture can leave little doubt of its identity. Its absence at the time of physical examination in 1926 suggests that it must have been very small, probably not a palpable abnormality. Some of the tumors reported have been small, notably that of Blair Bell[6] which was the size of a plum. Its slow growth, as well as its almost benign character, has already been noted,[18] only 1 case having developed metastases[14] with subsequent death. The infantile uterus is part of the picture described by R. Meyer,[15, 18] and the normal ovary on the other side is to be noted.

The female sex hormone studies here reported are the first made on any of the cases. The Frank-Goldberger method[20] was used and almost complete absence of blood cycle is suggestive of hormonal action on the part of the tumor, although the nature of this action is unknown. R. Meyer[16, 17, 18] repeatedly calls attention to the important part that hormones probably elaborated by the tumor play in producing the masculine changes.

The question of genesis of arrhenoblastoma of the ovary has aroused considerable discussion. Pick[2, 3] believes that it is the result of the proliferation of the testicular element in an ovotestis. R. Meyer[19, 16] in his studies of the development of the ovary has shown that the different forms of epithelium which make up the structure are related to one another, and differ only in the end stages where maldevelopment may give rise to different types of tumors. From the rete ovarii and medullary tubules, tubular adenoma may result; from the superficial epithelium, papillary tumors; and from the follicle or granulosa epithelium, granulosa cell tumors. As evidence that the rete ovarii and medullary tubules are probably the *anlage* of tubular adenoma, he[16] found groups of epithelial tubules in the hilum of the ovary of a forty-two year old woman. A similar finding in a newborn by H. O. Neumann[8] has also been recorded. Both authors believe that the rete ovarii is the homologue of the tubuli seminiferi recti in the male, and that both structures by their persistence may give rise to tubular adenoma. Attention has also been called to the so-called "interstitial" cells of Leydig which H. O. Neumann[9] found in great profusion in one of his tubular adenoma cases. In the tumor here reported no evidence of these cells has been noted. From examination of the literature, R. Meyer's findings ap-

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*Slides of the tumor were sent to Prof. Meyer to whom we are indebted for confirming the diagnosis, and classifying it.

pear to be almost conclusive. It is certain that much is owed to him for our present knowledge of the development of ovarian tumors as well as their characteristics.

It must be emphasized, however, that masculinization in the female is not exclusively associated with the type of tumor here described. Ovarian cystadenomas, teratomas, carcinomas, as well as adrenal and pineal tumors may also produce the changes. Halban[22] calls attention to the hypertrichosis in pregnancy and the postclimacterium. He believes that the sex of the individual is predetermined in the ovum, and that the gonad acts only as a "protective" influence. When tumors are present, they may by their hormonal action cause the development of latent sexual characteristics not suspected previously.[22] Masculinization may, however, also occur in the absence of any associated demonstrable abnormality, tumor or otherwise. A typical case recently was seen at the clinic of the Mt. Sinai Hospital. The patient is twenty-seven years old, unmarried, and complained of infrequent, scanty menstruation. She showed the stigmas of a moderate degree of masculinization. She was studied from every angle both in the clinic and on the ward, and was even subjected to laparotomy for a suspected ovarian tumor which was not found. All examinations have thus far proved negative. It is cases of this type which emphasize our limited knowledge in this field. Recently, Cushing[23] described a tumor of the pituitary, a basophilic adenoma, associated with changes in sexual characteristics, further complicating the subject.

At the present time, it would appear that hormonal studies offer the greatest hope for further enlightenment. In the type of abnormality here described, with or without tumor, these studies certainly should be made.

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145 WEST 86 STREET.

A STUDY OF 733 CESAREAN SECTIONS*

ISIDORE DAICHMAN, M.D., AND WILLIAM POMERANCE, M.D.,
BROOKLYN, N. Y.

(From the Obstetric Service of the Jewish Hospital)

FROM January 1, 1908, to January 1, 1932, 29,178 cases were delivered at the Jewish Hospital. Of these, 733 were delivered by abdominal cesarean section. This, roughly, gives us an incidence of 1:40 or 2.5 per cent. Table I gives the number of deliveries each year, the number of cesarean sections, and the deaths following section each year.

TABLE I

YEAR	NO. OF DELIVERIES	CESAREAN SECTIONS	DEATH FOLLOWING SECTION
1908	213	13	0
1909	325	13	0
1910	444	11	0
1911	518	12	0
1912	543	9	0
1913	587	13	0
1914	719	29	1
1915	767	32	0
1916	751	30	1
1917	963	32	2
1918	930	30	1
1919	908	35	1
1920	932	24	3
1921	955	25	2
1922	1031	24	0
1923	1167	37	2
1924	1555	24	1
1925	1872	45	0
1926	2057	33	1
1927	2355	31	0
1928	2293	51	2
1929	2322	57	1
1930	2512	64	6
1931	2459	69	1
	29,178	733	25

While it is generally true that cesarean section is on the increase, both in this country and abroad, a study of our figures indicates that in our series at least, there has been in recent years a decrease in the percentage of cases delivered by cesarean section. If we divide our cases into three eight-year periods as shown in Table II, the incedence of cesarean section from 1908-1916 and from 1916-1924 is roughly 3.0 per cent; while from 1924 to 1932, the incidence has fallen to 2.2 per cent.

TABLE II

YEARS	CASES DELIVERED	CESAREAN SECTIONS	INCIDENCE	DEATH AFTER SECTION
1908-1916	4,116	122	1:33.7 (3.0%)	1 (.82%)
1916-1924	7,637	237	1:32.2 (3.1%)	12 (5.1%)
1924-1932	17,425	374	1:46.5 (2.2%)	12 (3.2%)

Indications for Section.—The classification of indications for section is rather difficult because frequently there are several factors which determine that a given case be sectioned. Each factor per se may not be a sufficient indication but the existence of several in the same case make section imperative. Thus, a breech presentation or a slightly flattened pelvis, or the age of thirty-five in a primipara; any one of these alone is no reason for doing a cesarean section, but the combination of all three in a given case is more than sufficient reason. In such cases, the most important factor of the group would be classified as the indication. To use the same example given above, a breech presentation in a primipara of thirty-five with a slightly flattened pelvis would be placed under the heading of malposition due to breech presentation.

Table III gives the indications in the order of their frequency together with the maternal and fetal mortality for each group.

Disproportion.—In this group are included those cases in which the dystocia was due to contracted pelvis and also those in which disproportion was associated with a normal pelvis. Almost half of the cases, 348 or 47.5 per cent, fall into this group. Eleven mothers died, a maternal mortality of 3.2 per cent, and 15 babies died (4.3 per cent). All of the 15 babies were full term. Five were stillborn and 10 died shortly after birth.

Previous Cesarean Section.—This forms the second largest group with 180 cases (24.6 per cent); there were 4 maternal deaths (2.2 per cent), and 15 fetal deaths (8.3 per cent). One of the reasons why this group has a very low maternal mortality is that the majority of the cases in it were delivered by elective cesarean section, usually before the onset of labor, with membranes intact and no vaginal examinations. In our clinic we adhere to the dictum "once a section, always a section." Of the 15 fetal deaths, 4 were fullterm stillbirths; 2 premature, and 9 fullterm babies died shortly after birth.

Malposition.—This group of 40 cases forms 5.5 per cent of the total and includes 25 cases of breech presentation, 8 of transverse presentation, and 7 of face presentation. Two mothers and two babies died in this group, a mortality of 5.0 per cent. Both of the babies were full term. One was a stillborn fetus in a case of transverse presentation while the other was a face presentation that died of edema of the larynx a day or two after birth.

Toxemias.—Three types of toxemias form this group; eclampsia, pre-

eclampsia, and chronic nephritis. Of 37 cases, 30 were either pre-eclamptics or eclamptics, while 7 were chronic nephritics. The maternal mortality was 4 or 10.8 per cent, while the fetal mortality was 5 or 13.5 per cent. Of the 7 cases of chronic nephritis, 3 were sectioned at six months, 2 at seven months, and 2 at full term. All were sterilized. All the mothers

TABLE III

INDICATION	NO. OF CASES	MATERNAL DEATHS	FETAL DEATHS
A. Disproportion	348 (47.5%)	11 (3.2%)	15 (4.3%)
a. With contracted pelvis	304	9	13
b. With normal pelvis	44	2	2
B. Previous cesarean section	180 (24.6%)	4 (2.2%)	15 (8.3%)
C. Malposition	40 (5.5%)	2 (5.0%)	2 (5.0%)
a. Breech	25	0	0
b. Transverse	8	1	0
c. Face	7	1	2
D. Toxemias	37 (5.0%)	4 (10.8%)	5 (13.5%)
a. Eclampsia and preeclampsia	30	4	1
b. Chronic nephritis	7	0	4
E. Soft part dystocia (operative)	32 (4.4%)	0 (....)	1 (3.1%)
a. Vaginal plastics	18	0	0
b. Uterine operations	14	0	1
F. Soft part dystocia (nonoper.)	22 (3.0%)	1 (4.5%)	4 (18.0%)
a. Fibroids	12	1	1
b. Vaginal and cerv. atresia	5	0	2
c. Double uterus	3	0	1
d. Ovarian cyst	1	0	0
e. Tbc. of perineum	1	0	0
G. Uterine inertia and cerv. dyst.	20 (2.7%)	2 (10.0%)	0 (....)
H. Placenta previa	19 (2.6%)	1 (5.3%)	1 (5.3%)
I. Cardiovalvular disease	18 (2.5%)	0 (....)	1 (5.5%)
J. Previous stillbirths	9 (1.3%)	0 (....)	1 (11.1%)
K. Indication not stated	5 (0.7%)	0 (....)	0 (....)
L. Ruptured uterus	1 (0.14%)	0 (....)	1 (100.0%)
M. Prolapsed cord	1 (0.14%)	0 (....)	0 (....)
N. Banti's disease	1 (0.14%)	0 (....)	1 (100.0%)
TOTAL	733	25 (3.4%)	47 (6.5%)

lived. Of the five fetal deaths, one was a fullterm stillborn of an eclamptic mother, 3 were nonviable stillbirths (six months) of chronic nephritic mothers, while the fifth was a premature that died shortly after birth.

Soft Part Dystocia.—Of this particular indication, there are two groups; one in which the soft part dystocia was due to a previous operation such as a vaginal plastic or some uterine operation, and the other in which the soft part dystocia was nonoperative and was due to fibroids, double uterus, ovarian cyst, etc. The total number of cases in both these groups was 54 or 7.4 per cent. One mother died (1.8 per cent) and there were 5 fetal deaths (9.2 per cent) of which one was a fullterm stillborn. 2 died shortly after birth, and 2 were premature.

Uterine Inertia and Cervical Dystocia.—There were 20 of these cases. Some had primary uterine inertia with secondary cervical dystocia, others had cervical dystocia without any apparent cause. Most of these cases had a fairly long labor before section was resorted to. Two mothers died (10 per cent). There were no fetal deaths.

Placenta Previa.—There were 19 sections for this condition. The majority of them had a central placenta previa. One mother died (5.3 per cent), and there was one fetal death (5.3 per cent) due to prematurity.

Cardiovalvular Disease.—In recent years we have come to consider elective cesarean section the ideal treatment for cases of chronic cardiovalvular disease with a history of broken compensation. If the woman has had one or more children previously, she is always sterilized. A cer-

TABLE IV

CAUSES OF MORBIDITY (IN TERMS OF PATHOLOGY)

Wound infections	101 cases
Pelvic infections	13 cases
Sepsis	8 cases
Phlebitis	11 cases
Upper respiratory infection	18 cases
Endometritis	15 cases
Parotitis	3 cases
Breast infections	4 cases
Pyelitis	3 cases
Postpartum hemorrhage	2 cases
Tetanus	1 case
Epilepsy	1 case
Hematoma of abdominal wall	2 cases
Abscess of thigh	1 case
Evisceration	2 cases
Pulmonary embolism	1 case
Intestinal obstruction	2 cases

tain number of primiparas are also sterilized, especially those patients that have had severe breaks in compensation and in whom a subsequent pregnancy would be undesirable. There were 18 cases in this group. Twelve were primiparas and 6 were multiparas. Eight of the former and all of the latter were sterilized. None of the mothers died. There was one fetal death (5.5 per cent), a six months' stillbirth.

Previous Stillbirths.—There were nine cases in this group with no maternal and one (11.1 per cent) fetal death due to prematurity. One case was sectioned because of one previous stillbirth, four for two previous stillbirths each, three for three previous stillbirths each, and one for four previous stillbirths.

Miscellaneous.—In this group are included five cases in which the indication for section is not stated, one case of ruptured uterus, one of prolapsed cord, and one of Banti's disease. No mothers died. There were two stillbirths; one a fullterm fetus in the case of ruptured uterus; one a six months' fetus in the case with a history of Banti's disease.

Morbidity.—Any patient who had a temperature over 100° F. by mouth for more than a total of seventy-two hours of the patient's postoperative stay in the hospital was classified as a morbidity. Of the 708 sections that lived, there were 332 patients who had a morbidity. This gives us a total morbidity incidence of 46.8 per cent. These are further divided into several groups according to the number of days of temperature. One hundred and eighty-four cases had temperature from four to eight days (25.9 per cent) ; 79 had temperature from eight to twelve days (11.2 per cent) ; and 69 had temperature for twelve or more days (9.7 per cent).

This group of morbidities in terms of actual pathology covers only about half the cases that had a morbidity in terms of temperature. In the remainder of the cases there was no apparent cause for the temperature.

The relation of membrane rupture, number of vaginal examinations, and labor to average morbidity (number of days of elevated temperature) was as follows:

TABLE V

MEMBRANES		VAGINALS		HOURS IN LABOR	
CONDITION	AVERAGE MORBIDITY	NUMBER	AVERAGE MORBIDITY	NO. OF HOURS	AVERAGE MORBIDITY
Intact	5.0 days	none	4.5 days	0-12 hr.	4.1 days
Ruptured 0-12 hr.	5.5 days				
Ruptured 12-24 hr.	5.7 days	1 or 2	6.1 days	12-48 hr.	6.7 days
Ruptured 24-48 hr.	8.7 days				
Ruptured 48 hr. and over	9.4 days	3 or more	6.4 days	over 48 hr.	9.0 days

Table V shows rather strikingly that there is a definite relationship between the morbidity and the length of time the membranes have been ruptured, the length of time the patient has been in labor and the number of vaginal examinations.

Maternal Mortality.—In our series of 733 cesarean sections, 25 mothers died, giving us a maternal mortality of 3.4 per cent. We have made no correction in our maternal mortality, because we feel that in any patient who dies following section, the procedure itself is at least partly responsible for the death. The fatal cases were as follows:

Case 1.—1914. A primipara with a contracted pelvis. Membranes intact. One vaginal. In labor thirty-eight hours. Classical under ether. Died of peritonitis in forty-eight hours.

Case 2.—1916. Primipara with a flat pelvis and transverse presentation. Four vaginals at home. Membranes ruptured and in labor, exact time of each unknown. Classical under ether. Died of peritonitis in forty-eight hours.

Case 3.—1917. A primipara with a breech presentation and contracted pelvis. Membranes intact. Four vaginals; three of these at home. In labor twenty-four hours. Classical under ether. Died of peritonitis on fifth day.

CASE 4.—1917. Primipara with a contracted pelvis. Membranes ruptured five hours; in labor twenty-five hours; six vaginals at home. Classical under ether. Died of sepsis on nineteenth day.

CASE 5.—1918. Primipara with a contracted pelvis. Condition of membranes, number of vaginals and duration of labor unknown. Very poor chart. Classical under ether. Died of peritonitis on sixth day.

CASE 6.—1919. Primipara at term. Membranes intact, no vaginals, in labor at home for sixty hours and having convulsions. Classical section under ether. Had a severe hemorrhage while on the operating table. Died of shock due to hemorrhage within forty-eight hours.

CASE 7.—1920. Primipara, eight months pregnant having eclamptic convulsions. Membranes intact, not in labor, and no vaginals. Classical under ether. Died of septic pneumonia on ninth day. The sepsis followed an infection of the arm, the result of a venous puncture.

CASE 8.—1920. Primipara with a contracted pelvis. Membranes ruptured forty-eight hours. One vaginal. In labor forty-eight hours. Two flap section under ether. Died of myocardial failure in twenty-four hours.

CASE 9.—1920. Gravida two, membranes ruptured six hours, no vaginals and a few mild pains. Classical under ether because of a previous section. Died of peritonitis on sixth day.

CASE 10.—1921. Primipara with contracted pelvis. Membranes intact, no vaginals; mild pains for three hours. Classical under ether. Died of sepsis on sixth day.

CASE 11.—1921. Gravida three. Membranes intact; no vaginals; no labor. Elective classical section under ether because of two previous sections. Sterilized by excision of cornual ends of tubes. Died of peritonitis on third day.

CASE 12.—1923. Gravida four. Membranes intact; no labor; one vaginal examination. Central placenta previa. Three previous stillbirths. Contracted pelvis. Classical under ether. Died of peritonitis on fifth day.

CASE 13.—1923. Primipara with contracted pelvis. Membranes intact; no vaginals; in labor for twelve hours. Classical under ether. Died of peritonitis on third day.

CASE 14.—1924. Primipara eight and one-half months pregnant with disproportion due to large baby. Membranes ruptured thirty-one hours; no vaginals; in labor for thirty-four hours. Classical under ether. Died of peritonitis on fourth day.

CASE 15.—1926. Primipara with disproportion and primary uterine inertia. Membranes ruptured three hours; no vaginals; irregular pains for eighty-four hours. Two flap section under ether. Died of a pulmonary embolus six hours after operation.

CASE 16.—1928. Primipara forty-four years old with a contracted pelvis. Membranes intact; no vaginals; irregular pains for thirty-six hours. Classical under ether. Died of lobar pneumonia on sixth day.

CASE 17.—1928. Gravida two; eight and one-half months pregnant; membranes ruptured four and one-half hours; no vaginals; mild pains for two hours. Classical section and tubal ligation under ether on account of a previous section. Died of a pulmonary embolus on the fourth day.

CASE 18.—1929. Primipara thirty-five years old with a breech presentation and disproportion. Membranes ruptured forty-eight hours; no vaginals; fairly good pains for forty-six hours. Classical under spinal. Died of peritonitis on the fourth day.

CASE 19.—1930. Primipara forty years old. Dystocia due to multiple fibroids. Membranes intact; no vaginals; pains for twenty-four hours. Classical under spinal. Died of peritonitis on sixth day.

CASE 20.—1930. Primipara with primary uterine inertia and cervical dystocia. Membranes ruptured ninety-six hours; no vaginals; irregular pains for ninety-six hours. Classical section under spinal. Died of peritonitis on the fifth day.

CASE 21.—1930. Primipara thirty-five years old with disproportion due to large baby. Membranes intact; no vaginals; mild pains for only three hours. Classical section and subserous myomectomy under spinal. Died of peritonitis on the eighth day.

CASE 22.—1930. Gravida two with a history of a previous stillbirth following a difficult instrumental delivery, in a contracted pelvis. Membranes ruptured six hours, no vaginals; mild pains for six hours. At time membranes ruptured, temperature was 101.5. At time of section temperature was 103° and patient had just had a severe chill. Classical under spinal. Died of sepsis in forty-eight hours.

CASE 23.—1930. Primipara forty-two years old with a history of progressive pre-eclamptic toxemia, a breech presentation and a fibroid uterus. Membranes intact, no vaginals, no labor. Elective classical under ether. The patient was a large obese colored woman. She took the anesthesia poorly and died of respiratory failure on the operating table while the abdomen was being closed. Autopsy revealed an unsuspected syphilitic aortitis. Blood Wassermann had been done and reported negative.

CASE 24.—1930. Gravida two with a history of one previous section. Membranes intact; no vaginals; no labor. Elective classical section and modified Pomeroy sterilization under spinal. Died of sepsis due to a staphylococcemia on the seventieth day.

CASE 25.—1931. Primipara at full term in eclampsia. Membranes intact; no vaginals; no labor. Classical under spinal. Died five hours postoperative of symptoms suggesting a cerebral hemorrhage.

TABLE VI.   MATERNAL MORTALITY

CAUSE OF DEATH	NO. OF CASES	INDICATIONS FOR SECTION			
Peritonitis	13	Contracted pelvis	4	— Cerv. Dystocia	1
		Previous sections	2	— Transverse	1
		Disproportion	2	— Fibroids	1
		Placenta previa	1	— Breech	1
Sepsis	5	Contracted pelvis	3		
		Previous section	1		
		Eclampsia	1		
Pulmonary embolus	2	Previous section	1		
		Primary uterine inertia	1		
Pneumonia	1	Contracted pelvis	1		
Myocardial failure	1	Contracted pelvis	1		
Hemorrhage and shock	1	Eclampsia	1		
Shock, possibly due to syphilitic aortitis or to ether	1	Preeclampsia and fibroids	1		
Eclampsia	1	Eclampsia	1		
	25				

Over 80 per cent of the deaths (21 out of 25) are due to infection. A study of the condition of the membranes at time of operation, the number

of vaginal examinations, and the duration of labor in these 25 cases reveals the following facts:

Membranes.—Condition unknown in 2 cases, intact in 13 cases and ruptured in 10 cases. The length of time of ruptured membranes varied from three to ninety-six hours. The average was 27.5 hours.

Vaginal Examinations.—There were no vaginals done in 19 cases, 5 had 16 examinations, varying from 1 to 6. In one, we cannot tell from the chart whether or not any vaginals had been done.

Hours in Labor.—Six cases had no labor, 17 had an average labor of thirty-two hours (the shortest being three hours, and the longest ninety-six hours), while in 2 cases the number of hours of labor is not definitely known.

Fetal Mortality.—The gross fetal mortality was 47 or 6.5 per cent. If we correct for prematurity and monstrosity, the corrected fetal mortality becomes 27 or 3.7 per cent. This is shown clearly in Table VII.

TABLE VII. FETAL MORTALITY

	TOTAL	PREMATURE	MONSTROSITY	CORRECTED
Stillbirths	18	7 (nonviable)	1	10
Neonatal Deaths	29	8 (nonviable)	4	17
Totals	47 (6.5%)	15	5	27 (3.7%)

The Stillbirths.—Of these there were 18 (2.5 per cent). Seven were premature and nonviable, all being less than twenty-eight weeks pregnant. Eleven were full term. One of these was a hydrocephalic monster. In the premature group, 3 of the sections were done for chronic nephritis, one for previous section, one for bleeding fibroids, one for Banti's disease, and one for double uterus. The 11 fullterm stillbirths warrant a few words of explanation. One of these was a hydrocephalic monster in a mother with a generally contracted pelvis and preeclamptic toxemia. One was a dead fetus in a markedly generally contracted pelvis; a third was also a dead fetus lying in a transverse presentation, and the mother had had a previous section. One was in an eclamptic mother, one in the case of a ruptured uterus, and one was again a transverse presentation. In one case the mother had a temperature of 103° F. at time of section. Three cases had a generally contracted pelvis with fairly long labors, and finally one case had a toxemia as well as a previous section.

The Neonatal Deaths.—There were 29 babies (3.9 per cent) that died in the first two weeks of life. Eight were premature, 21 full term. The causes for the neonatal deaths were: Prematurity 8, monstrosity 4, upper respiratory infection 5, atelectasis 3, sepsis 2, cerebral hemorrhage 1,

congenital syphilis 1, edema of larynx 1, and in 4 cases the cause of death was unknown.

Elective Cesarean Sections.—Under this category are included those patients who were sectioned before the onset of labor with membranes intact. They may or may not have had one or more vaginal examinations; although most of them were not examined vaginally. We are not including in this group patients who were sectioned for eclampsia or placenta previa, because we consider a case that has had one or more convulsions or a hemorrhage as a poor risk for operative interference because of the greater danger of infection.

In this group there were 152 cases. Of these a little over half (78) were sectioned for previous section, while 31 or about 20 per cent were sectioned for contracted pelvis. The remaining 43 cases were sectioned for such indications as preeclampsia, cardiac disease, chronic nephritis, previous plastics, previous stillbirths, etc.

In this series of 152 elective sections, 3 mothers died giving a maternal mortality of 1.9 per cent. One of these died of peritonitis, one of sepsis, and one died on the operating table (autopsy revealed a syphilitic aortitis in this case).

There were 12 fetal deaths (7.9 per cent) in this group. If we again correct for prematurity and monstrosity, the fetal mortality is 3 or 1.9 per cent. Of these 3, two died of a bronchopneumonia and one of atelectasis.

In this series of 152 cases only 37 or 24.8 per cent had a morbidity using the definition given above. This morbidity of 24.8 per cent for the elective cases compares very favorably with the percentage of morbidity for the entire group of 708 cases which is 46.8 per cent. The average number of days of elevated temperature in the elective group was three and five-tenths days as compared with six and four-tenths days of temperature for the nonelective group.

Type of Operation.—There are only 57 low flap sections in this study of 733 cases. At our hospital, classical section is still the procedure of choice, although in the last few years some of our men have resorted to the low flap section especially in cases that have been in labor a fairly long time or where the membranes have been ruptured for some time. Although the maternal morbidity and mortality in the 57 low flap sections are practically the same as for the 525 nonelective sections, actually these figures speak in favor of the low flap section, because these 57 cases had a much longer test of labor and the average number of hours of ruptured membranes was considerably greater than in the nonelective classical group.

In this series there were 6 Porro sections. Four cases were done for fibroids, one for ruptured uterus, and one for bleeding. All of the mothers lived. Three of the babies were stillborn, and three alive. The average number of days of temperature in these six cases was eight.

The best results in maternal morbidity and mortality are obtained in the elective group of sections. This is to be expected, because the membranes are intact and there has been no labor. These facts are clearly shown by Table VIII.

TABLE VIII

	NO. OF CASES	AVER. NO. OF HOURS OF RUP. MEM.	AVER. NO. OF HOURS IN LABOR	AVERAGE MORBIDITY	MATERNAL MORTALITY
Nonelective Classical	525	9	17	6.2 days	3.8%
Nonelective Low Flap	56	23.6	33.5	6.6 days	3.6%
Elective Group (all but one are Classical)	152	0	0	3.5 days	1.9%

SUMMARY AND CONCLUSIONS

1. Although cesarean section is on the increase, in our series of cases, the percentage of cases thus delivered in recent years shows a slight decrease.

2. Of 733 cesarean sections, 25 mothers died, giving a maternal mortality of 3.4 per cent. This, we believe, compares favorably with similar series reported from other institutions.

3. Any case that had over 100° F. by mouth for more than a total of seventy-two hours, was classified as a morbidity. With this as a standard, 46.8 per cent of our cases had a morbidity.

4. The gross fetal mortality is 6.5 per cent. Correcting for permaturity and monstrosity, it is 3.7 per cent.

5. The best results are obtained in the group of 152 elective sections. The maternal mortality is 1.9 per cent; the corrected fetal mortality 1.9 per cent, and the average number of days of elevated temperature 3.5.

6. Although there are only 57 low flap sections in this series, the maternal mortality and morbidity are not any higher than for the nonelective classical cases in spite of a much longer test of labor and greater period of ruptured membranes. This can justly be used as an argument for the low flap section in the so-called "potentially infected" cases.

RUPTURE OF THE GRAAFIAN FOLLICLE, THE CORPUS LUTEUM AND SMALL FOLLICLE OR LUTEIN CYSTS SIMULATING APPENDICITIS*

JOE VINCENT MEIGS, M.D., AND W. FENN HOYT, M.D., BOSTON, MASS.

(From the Surgical Service of the Massachusetts General Hospital)

INTRODUCTION AND HISTORY

DURING the years 1929, 1930, and 1931, twenty-two patients with hemorrhage from the ovary were operated upon at the Massachusetts General Hospital and three others were operated upon in nearby hospitals by two of its surgeons. The bleeding in these cases arose from the edge of a recently ruptured follicle, from a superficial vessel of a fresh corpus luteum, or from the edge of a ruptured cyst. In the first two types the blood vessels opened up again after a normal physiologic process should have closed them. In many cases operation could have been avoided because exploration showed that the bleeding had ceased or that it was simply physiologic. An intelligent interpretation of the history and physical findings in these cases of ovarian rupture is very important.

The greatest difficulty lies in differentiating rupture of the ovary from appendicitis. Most of the patients give a history clearly simulating a mild attack of appendicitis. They have pain, nausea, and occasionally vomiting. There is tenderness and spasm of the lower abdomen and tenderness by rectum. The temperature and pulse are often slightly elevated. The urine is usually negative and the white count a little increased. The pain of appendicitis is usually gradual in its onset whereas in rupture of the ovary, whether mild or severe, it is almost always very sudden. This suddenness of the onset of pain is of great importance in the differential diagnosis. The relation of the onset of the condition to the date of the catamenia is of importance in the diagnosis and also in distinguishing between a rupture of a follicle or of a corpus luteum. The sudden onset of pain and the relation of the pain to the oncoming catamenia are the two most important points in differential diagnosis.

The condition is not a new one. There are many reports of one or two cases scattered throughout the literature. In 1930 Johnson[6] was able to find a total of 77 cases reported to date. Some of the cases included in the literature are of ovarian hematomas, either hemorrhage into a follicle or hemorrhage into a corpus luteum or hemorrhage into a small cyst. Such cases are not included in this series. The cases analyzed here are those of either fluid or hemorrhage in the peritoneal cavity arising from the rupture of an ovary. The ovarian accident

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causes enough pain to make operation seem a necessity. There are
two types of bleeding, the mild and the fulminating. In the mild cases
surgery would not be necessary if the diagnosis could be accurately
made, but in the fulminating cases, with a large amount of blood in
the abdomen, surgery is necessary. Stuckert[1] states that "two types
of ovarian hemorrhage may be distinguished. In one the bleeding is
primary, and in the other it follows the rupture of a hematoma." He
quotes Wilson[2] as stating that in normal conditions a rounded clot is
formed filling the ruptured follicle but occasionally this does not occur
and the patients early show signs of severe intraabdominal hemor-
rhage. Most patients with this condition who are operated upon for
appendicitis have their appendix removed through a right rectus in-
cision, made opposite or just below the umbilicus, or through a McBur-
ney's incision. The pelvis is not explored and the true lesion is not
suspected. Often the fluid or blood does not rise above the pelvic brim.
Women with symptoms suggesting mild appendicitis ought always to
be operated upon in such a way as to allow careful inspection of the
pelvic organs. In a woman with acute abdominal symptoms no sur-
geon should be satisfied at finding an appendix that is not very defi-
nitely inflamed. Exploration of the pelvic organs, and by exploration
is not meant palpating the pelvic organs, but inspecting them, is an
essential part of every surgical procedure in women. If this were done,
many more cases of rupture of the ovary would be found and eventually
fewer cases of this type would be operated upon.

It is to demonstrate the frequency of this clinical condition that this
paper is written. The diagnosis is now being made at the Massachu-
setts General Hospital as will be seen in the analysis of our cases. Wil-
son[2] and Block[3] both doubt whether the diagnosis can ever be made, and
they believe that in all cases previously reported the correct diagnosis
was not made in any. Greenhill[5] has been given credit for the only
correct diagnosis previous to operation. Our analysis shows that in cer-
tain cases operation could have been avoided and in the future surely
will be.

ANALYSIS OF CASES

Twenty-two cases from the Massachusetts General Hospital and 3 from
the private practice of 2 of its surgeons are analyzed below. The young-
est patient was fifteen years of age and the oldest forty. Nine were be-
tween fifteen and twenty years of age and 10 between twenty and twen-
ty-five; the average age being 22.4 years. Thus, this abnormal physiolo-
gy occurs most frequently in young women after the onset of menstrua-
tion. Nineteen patients were single and 6 were married. Only 2 of
the 6 had children. Therefore, most of the patients were single, young,
and had no children. None had had any previous abdominal operation.
Thirteen of these women had had from one to several similar attacks
previously. Trauma has been mentioned as an etiologic factor; the
rupture occurring during bimanual examination of the pelvis, a sudden

misstep, or a sudden blow. In none of our cases was there a history of injury directly before the attack. The patients complain of abdominal pain, usually located in the right lower quadrant. Occasionally the pain extends across the lower pelvis, but in most instances it is localized in the right side. Four had left lower quadrant pain, one abdominal cramps, one had pain in the right groin, while 18 complained of pain in the right lower quadrant. Nausea is common and sometimes vomiting occurs. In our cases 11 had nausea, 3 had slight nausea, and 11 had no nausea. In 17 there was no vomiting, but in 7 this was a symptom. None of our cases had abnormal vaginal bleeding. Abnormal vaginal bleeding should be an aid in differentiating this lesion from extrauterine pregnancy, for although bleeding does not always occur in ruptured extrauterine pregnancy, nevertheless, it is considered one of the diagnostic points. Four patients had a mild leucorrhea. In 14 cases the patients complained of *sudden* abdominal pain. Six others had a gradual onset of pain with a sudden acute exacerbation. The sudden onset of pain is quite different from the pain of appendicitis, because in appendicitis the onset is most often gradual. Much emphasis must be placed on the manner and type of onset of pain.

Eighteen patients had a normal menstrual history. In 2 the catamenia was irregular, and in 4 it was not stated. One had had amenorrhea for one year and one month. Apparently, there is no clue to the diagnosis in either a normal or an abnormal menstrual history. However, the time of onset of the pain in relation to the day of the menstrual cycle is an important differential point both in relation to the presence of a rupture of an ovary and in relation to the type of rupture, whether follicle or corpus luteum. Two patients had pain one week following the onset of their menstrual period, 14 two weeks following the onset, and 3 three weeks following the onset. Two had pain three days before the next period was due, one four days, one at the onset of menstruation, and in 5 it was not stated. Pain in the middle of the intermenstrual period is usually due to rupture of a graafian follicle, and pain occurring at this time, sudden in onset, should make one suspicious of the rupture of a follicle. Ordinarily the rupture of a graafian follicle is a normal physiologic phenomenon and does not cause pain except in a few instances. Occasionally, in taking a menstrual history, pain at the time of ovulation can be elicited. A rupture with bleeding from the edges of the broken follicle can cause severe symptoms. When the pain occurs about a week before the onset of the next period, it is usually due to bleeding from the corpus luteum. The normal thin covering of the corpus luteum breaks and bleeds. Rupture of a small follicle cyst or corpus luteum cyst may take place at any time during the menstrual cycle. Such cases are fewer than those of the rupture of a follicle or the rupture of a corpus luteum.

The patients usually have tenderness in the right lower quadrant with some muscle spasm, but both tenderness and spasm can extend

across the lower abdomen. As many of these women are unmarried, pelvic examination is unsatisfactory. Rectal examination may elicit definite tenderness on moving the uterus and tenderness in the right vault. In most of our later cases that have been more carefully observed, this tenderness by rectum on the right or left side, was frequently present. In no case was it possible to demonstrate a mass. The mouth temperature ranges from normal to 102° with the majority from 98.6° to 100° and the average 99°. Only one patient's temperature reached 102°. The pulse is usually slightly elevated, the average 98. Only patients with massive hemorrhage had a marked elevation of the pulse. Frequently pallor can be seen as a result of a moderate amount of bleeding and pain. It is usual, therefore, to find a slightly elevated temperature with a consistently but only slightly elevated pulse. The white blood count varies from 6,000 to 24,000. No report of the count could be found in 7 of these cases. There were 10 patients with a count between 6,000 and 10,000, 3 between 10,000 and 12,000, 2 from 13,000 to 14,000, one from 14,000 to 16,000, one from 19,000 to 20,000, and one of 24,000. It is apparent that in these cases the white count is only moderately elevated, while in acute appendicitis it is usually considerably higher. Considering the amount of pain and discomfort that these patients have, the temperature, pulse, and white count are but very little affected. These facts should make one doubt a diagnosis of appendicitis. From our material it can be concluded that rupture in an ovary should be suspected in patients who are young, who have not had children, who have not had previous abdominal operations, and who have had previous attacks; also when the physical signs do not seem consistent with the degree of pain and the amount of tenderness that can be elicited. The added fact that the pain is *sudden* and occurs in the midmenstrual time or just before an expected period should make one suspicious of some sort of ovarian rupture rather than an acute appendiceal lesion.

<div align="center">TREATMENT</div>

Because of the pain and physical findings these patients are usually operated upon. The most frequent diagnosis is appendicitis. In mild cases, if ovarian rupture is suspected, the patient should be kept under close observation in the hospital. Brakely[3] and Farr in their conclusions state that with rare exception operative treatment is not indicated. (This is true if the diagnosis can be made, but it is difficult not to operate upon these women.) They believe that in cases of doubt observation for a few hours is justifiable, but that as there is grave danger in delay in appendicitis and very little danger to exploratory operation, it is wiser to operate if the symptoms do not subside. Until we are more experienced these patients will be operated upon. If operation is decided upon a right pararectus incision is advised. The incision should be made just to the right of the midline and the rectus muscle

retracted laterally. This incision provides the operator with adequate room to observe the pelvic organs and remove the appendix. On opening the abdomen occasionally blood or bloody fluid is at once seen. Many times nothing abnormal is noticed. The appendix does not look diseased enough to explain the symptoms. On exploring the pelvis a yellowish fluid may be found and sometimes a thick coagulum. This usually means the rupture of a graafian follicle rather than of a corpus luteum. In 2 cases old blood was found; in 5 blood-stained fluid; and in 11 bright red blood was found. In the cases with red blood in the pelvis, if the ovary is picked up gently, a small rupture or bleeding point may be found and oozing will be seen coming from a fresh corpus luteum. In only 2 cases was severe intraabdominal hemorrhage encountered. In one of these patients the abdomen was full of blood and clots. The bleeding arose in a ruptured corpus luteum. In another on opening the abdomen a gush of blood poured out such as is so often seen in extrauterine pregnancy. This patient had a bleeding corpus luteum. In one of the above cases the ovary was removed, and in the other it was sutured. The treatment of the ovary is important. The ovary should never be removed unless it is the site of a cyst which involves the whole organ. Mattress sutures may be placed through the bleeding corpus luteum or through the bleeding follicle. In our cases nothing was done to 11 ovaries as the bleeding had stopped or was of very little moment. In these 11 cases surgery would not have been necessary if the operative findings could have been visualized before operation. Therefore 11 out of 25 cases might have avoided surgery if the diagnosis could have been made accurately. In 5 cases the ovary was removed. In 6 cases mattress sutures were used to stop the hemorrhage. In 2 cases a small cystic ovary was removed, and in one case, in which the condition was not understood, both ovaries were removed. The ovary was removed from one patient with a ruptured graafian follicle. The reason for this will be discussed later. The right ovary was involved 18 times; the left 3; and in 4 cases the records do not state. One patient had an old chronic pelvic inflammation. This case and one with acute appendicitis were the only 2 that had any other pathology other than bleeding from the ovary. The cause of the bleeding or the fluid in the abdomen was due to the rupture of a graafian follicle in 4 patients, to a small corpus luteum cyst in one, in 2 it was doubtful whether the lesion was a corpus luteum or a follicle, and in 18 cases the bleeding came from the corpus luteum.

PREOPERATIVE DIAGNOSES

The preoperative diagnoses made in these cases are interesting. There were no preoperative diagnoses of ectopic pregnancy contrary to expectations. The diagnosis of salpingitis was made 4 times and tuberculous salpingitis once. The preoperative diagnosis of appendicitis was made in 12 of our cases. The diagnosis of a ruptured graafian follicle was

made 3 times, and the diagnosis of a ruptured corpus luteum was made 4 times.   This is of interest because of Wilson's[2] and Block's[3] statement that the diagnosis has never been made.

CASE REPORTS

There are two cases of interest in this group, one, a private case operated upon for acute appendicitis, also had a ruptured follicle. This patient had the symptoms of appendicitis for three days, mild, grumbling, lower abdominal pain without temperature. She was seen by one of us in the evening after she had returned home from the theater. While sitting quietly in the theater, she suddenly had a severe abdominal pain which made it necessary for her to leave and go home. When seen she had a temperature of 101° and her white count was 15,000. A diagnosis of acute appendicitis was made. However, it was felt that her acute sudden pain was due to a rupture of a graafian follicle. It was exactly her midmenstrual time, and therefore, the time for ovulation. At operation a large, acute appendix was found and in the right ovary was a rupture of a graafian follicle.
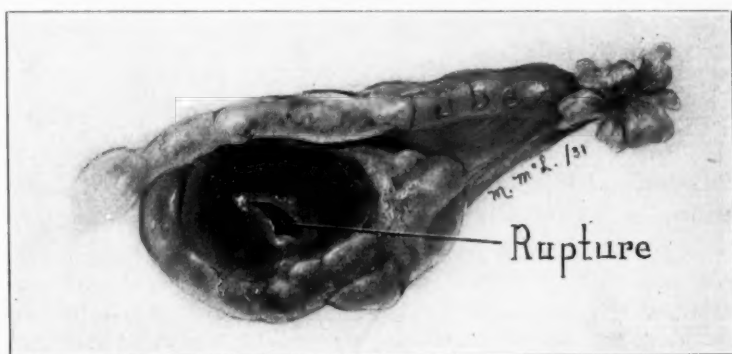
Fig. 1.—Drawing of a ruptured graafian follicle. The ovary and tube are normal. Bleeding arises in the small vessels in the thin wall of the follicle.

In the pelvis there was about a cupful of bloody fluid, some of it rather bright. Her ovary was removed, and a drawing of it is shown in this article (Fig. 1). Interestingly enough, on the second day after the removal of the ovary, menstruation took place two weeks early.

The second patient had had amenorrhea for one year and one month. Amniotin pessaries were used in an attempt to establish her menstrual cycle. Abdominal cramps and pain occurred. She had nausea and some spasm, and a diagnosis of appendicitis was made. At operation a recently ruptured graafian follicle was found in her right ovary. Her appendix which was normal was removed, and nothing was done to the ovary. One week after the operation the patient started to menstruate for the first time in over a year.

CONCLUSIONS

1. Twenty-five patients with rupture or bleeding from the ovary have been recently operated upon at the Massachusetts General Hospital.

2. In many of these cases operation could probably have been avoided.

3. In making a diagnosis of appendicitis in young women a rupture of the ovary should be considered.

4. Rest in bed and careful observation might prevent unnecessary operations for "mild acute appendicitis."

5. Sudden onset of pain, low temperature, slightly elevated pulse, and low white count out of proportion to the pain are findings suggestive of this lesion.

6. In reporting these cases and from the conclusions drawn, the authors feel a responsibility, for careless observation and unnecessary delay might endanger the life of a woman with acute appendicitis.

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264 BEACON STREET.

THE PROBLEM OF "CLINICAL GONORRHEA" IN THE FEMALE*

EMILY DUNNING BARRINGER, M.D., F.A.C.S., HYMAN STRAUSS, M.D., AND DANIEL F. CROWLEY, M.D., NEW YORK, N. Y.

(From the Kingston Avenue Hospital)

DIAGNOSIS of gonorrhea in the female is often difficult, and varies with the stage of the infection at the time the examination for diagnosis takes place. Thus, in the acute and subacute stages it is usually easy to obtain a positive culture or smear. But in the later subacute and chronic stages of gonorrhea in the female, the gonococcus is difficult or impossible to identify by culture or spread. Yet the case is still clinically a case of gonorrhea and a menace from the standpoint of infection. The possibility of the infection not being gonorrhea but due to other organisms giving similar clinical symptoms and confusing results on spread analysis, makes the difficulty of diagnosis the greater.

The necessity for some other test for diagnosis in the later subacute and chronic stages becomes very apparent, and a serologic test, similar to the Wassermann in syphilis, seems a logical one to hope for.

Some years ago it was possible under ideal research conditions in the "gonorrheal wards" of the Kingston Avenue Hospital, to study the complement fixation test in the female. The results of this intensive study of 256 cases were very encouraging. The conclusions obtained on this first series were as follows:†

†The Williams rules for spread diagnosis were followed and all the cases were subjected to a weekly bacteriologic and serologic examination.

Williams' terminology of spreads for gonococcus is as follows:

+ is positive spread = gram-negative intracellular biscuit shaped diplococcus.

"D. A.," is doubtful A. spread = any suspicious gram-negative intracellular diplococcus.

"D. B.," is doubtful B. spread = no suspicious intracellular cocci but 50 per cent or more pus cells.

— is negative spread = no suspicious intracellular cocci and less than 50 per cent pus cells.

1. A definite diagnosis of gonorrhea on a ± complement fixation test, which is a weakly positive reaction. A nongonorrhoeic does not give a positive reaction.

2. The complement fixation test in women has a distinct value, which is greatest in the chronic and subacute cases from the standpoint of diagnosis and prognosis.

3. It is of less value in acute cases, from the standpoint of diagnosis, but probably equally valuable from the standpoint of prognosis.

4. The subsidence of the complement fixation test with the clinical symptoms is proved in this series.

5. The reappearance of a high complement fixation reaction during convalescence suggests an active focus.

6. A persistent negative complement fixation with positive bacteriologic findings is rare, and at this date cannot be explained satisfactorily.

7. A persistent negative complement fixation with negative clinical and bacteriologic findings, can be interpreted as an index of the probability of a cure of gonorrhea in women.

8. It is suggested as a tentative and entirely arbitrary standard that, in order to pronounce a cure of gonorrhea in women, it is necessary to have these three persistent negative findings over a period of six months, because the cure in women is probably somewhat slower than in men.

To those of us who participated in the special research, the results of this series were most hopeful and worth while. The test gave a far higher percentage of positive diagnoses in "clinical gonorrhea" than any other. But there seemed a strange reluctance on the part of physicians and laboratory workers to perfect the laboratory end of the test. There was a certain complacency about letting "clinical gonorrhea" cover these undiagnosed cases and the complement fixation test was considered unreliable and useless.

While condemning the test it was interesting to note that clinicians and laboratory workers failed to bring forward any other test that compared in efficiency with the complement fixation as done by an expert.

We determined therefore to find out why the complement fixation was considered so unreliable; and the matter was discussed with as many representative authorities as could be found. The criticism of instability was very widespread, but by hunting for the reasons for this, there was a consensus of opinion as to two general faults:

1. The great difficulty of getting a stable *standardized* antigen.

2. The need of a highly trained technician who thoroughly understands the test. This test cannot be successfully carried out by a half-trained indifferent technician, such as are often found in the big laboratories where there is a mass of routine work to be turned out.

As neither one of these objections seemed insurmountable we determined to repeat our former series and go over the whole ground again under ideal conditions and with the same people conducting the entire research, thereby eliminating the personal equation. This time however we wanted to do it on a big enough scale to include *cultural* work so that in proving the cases *not* gonorrhea, we might find out what *other* organisms were giving the symptoms.

These were the reasons which prompted this present study of the problem of so-called "clinical gonorrhea."

We have undertaken a simultaneous study, including (1) The bacteriologic findings, by Dr. Anna W. Williams; (2) The serologic findings by Dr. Archibald McNeil*, and (3) The clinical findings by Dr. E. D. Barringer.

Two hundred cases were taken, which had been admitted to the service as gonorrhea for further diagnosis and treatment.

RESULT OF THE SURVEY

Several general observations were made from this simultaneous clinical, bacteriologic, and serologic study of these 200 cases.

1. The results of this second series of cases show that the conclusions as to the value of the complement fixation test, are practically identical with those presented on the first series quoted above.

2. We believe that we have an antigen that can be standardized and made entirely practical and that this test should be used by specially trained technicians who thoroughly understand it.

3. Bacteriologic examinations, especially cultures have proved that organisms other than the gonococcus may be responsible for many cases of ''clinical gonorrhea.''

The present paper will be devoted to the clinical interpretation of the findings:

AN ANALYSIS OF 200 CASES OF CLINICAL GONORRHEA

Evidence of gonorrhea proved in	110 cases
No evidence of gonorrhea proved in	90 cases

Organisms Other Than the Gonococcus Found by Culture and Spread†

Catarrhalis	6 cases
Coccobacillus	10 cases
Gram-negative bacilli	
Coli group	31 cases
Influenza	10 cases
Others	68 cases
Actinomyces	13 cases
Yeast	15 cases
Streptococci	
Alpha	33 cases
Gamma	18 cases
Unclassified	58 cases
Gram-positive bacilli	
Diphtheroids	76 cases
Others	26 cases
Trichomonas	70 cases
Clinical Outcome.—	
Cured or improved	199 cases
Death	1 case
	200

*The serologic findings developed in this study have been published in a paper by Dr. McNeil, which has already appeared in the *Proceedings of the Society for Experimental Medicine and Biology* **29**: 983, 1932. However, the methods as described were the outgrowth of the work done in connection with Dr. Barringer's research and cannot be reprinted here for lack of space.

†These organisms were found associated with the gonococcus, or associated with each other, or in pure culture.

Following are the 110 cases of gonorrhea arranged in groups to demonstrate the relative number of positive results of tests.

BY CULTURE ALONE	BY SPREAD ALONE (+ or "D. A.")	BY COMPLEMENT FIXATION ALONE (+ or ± Cont'd)	BY CULTURE AND SPREAD	BY CULTURE AND COMPLEMENT FIXATION	BY SPREAD AND COMPLEMENT FIXATION	BY CULTURE SPREAD AND COMPLEMENT FIXATION
1	12	27	2	4	23	41

Reading across the above table the following tabulation may be made of the relative frequency of the positive findings of these tests.

TOTAL CULTURES	TOTAL SPREADS	TOTAL COMPLEMENT FIXATION
1	12	27
2	2	4
4	23	23
41	41	41
——	——	——
48 cases	78 cases	95 cases

It is apparent that the complement fixation test established a positive diagnosis in more cases than either of the other tests, 95 cases, as against 48 cases by culture, and 78 cases by spread.

The usefulness and the limitations of the complement fixation test must be carefully noted. Gonorrhea does not as a rule manifest the systemic involvement associated with syphilis. It generally travels by direct extension through the genital tract of either sex and, in women, when it reaches the peritoneum usually becomes localized. However in a small percentage of cases in both sexes, there may be involvement of joints, heart, and other viscera. Rarely a serious, generalized blood infection by the gonococcus may lead to a septicemia or pyemia.

Thus in every infection by the gonococcus during the acute and subacute stages there is probably more systemic involvement than is ordinarily assumed.

Where would modern syphilis therapy be, if the Wassermann test was not available as a guide to medication and prognosis? A similar though less dramatic need exists in the treatment of gonorrhea.

From watching many hundreds of gonorrhea cases on this service and from other sources, it would seem that a certain typical complement fixation curve can be looked for, and it is very important to know its relation to the clinical curve if the complement fixation test readings are to be of any practical use.

Thus, in the *acute* stage of gonorrhea, one may expect the clinical curve at its height, fever, pain, leucocytosis, local inflammatory symptoms, prob-

able positive spreads and cultures, with the complement fixation reaction usually negative until the third to fifth week, when it usually gradually rises.

During the *subacute* stage the clinical curve is gradually coming down (in uncomplicated cases) ; spreads and cultures are becoming suspicious or negative, but the complement fixation is still going up or remaining high.

In the *chronic* state (if progress is satisfactory) the bacteriologic findings become negative and the clinical curve and complement fixation curve subside together.

Positive complement fixation test readings, especially 3+ and 4+ and over, have a definite clinical value in our estimation, which can be relied on and should not be ignored. These higher readings occurring in the *acute* stage generally mean a fulminating infection and are a danger signal of a possible stormy clinical course. This is well shown in two operative cases of this series. Both developed a 4+ reaction in the *acute* or *early subacute* stages, both were fulminating, desperate cases with early peritoneal involvement calling for most exacting surgical judgment when to operate. In the first case we waited a little too long, hoping the peritonitis would localize, and when we opened the abdomen, we found it had already spread extensively. She died within a few hours, the only death on our series. The second patient, I believe, did not die because we waited long enough to have the process become localized before operation, and she made a stormy but very satisfactory recovery.

The complement fixation readings 2+, 3+, 4+, and over are always to be respected. In the later subacute and chronic stages they generally mean a full blown, typical gonorrheal invasion which is running its usual course. This usual course should show a steady downward curve.

So that as the clinical picture subsides and the bacteriologic findings become negative, the complement fixation drops to a 1+ reading, then to ±, to a – trace, to –. It may take two to three months for a cured case of gonorrhea to show a negative complement fixation reaction and a case should be kept under observation until this is obtained.

THE INTERPRETATION OF A – OR ± READING BY THE COMPLEMENT FIXATION PROCESS

It is necessary to know this clinical curve in estimating a minus reading. As the complement fixation test does not usually become positive until the third, fourth, or fifth week, a minus reading would be expected in the early weeks.

Again a minus reading may be the end of the clinical curve, when a fading ± becomes a definite minus reading as the convalescence progresses to cure.

As to a ± reading, we have considered this as a very weakly positive finding in the conclusions of series one, as noted above.

It is probably only fair to disregard a single reading as being a weakly positive finding; and yet in my own experience, it immediately becomes a challenge, so accurate have I found these readings to be in their correlation to clinical findings. A repeated or persistent ± reading we feel sure should be interpreted as a weak plus.

Further study of the group of 110 cases of gonorrhea shows that there were 15 cases which did not give the complement fixation reaction and an analysis of these 15 cases is as follows:

In 6 of these 15 cases the diagnosis was based on a *spread* analysis *only,* the culture and complement fixation tests being negative. In each of these 6 cases, the diagnosis was based not on a positive spread but on a suspicious spread. It is debatable whether these 6 cases should have been considered positive cases of gonorrhea. It is also conceivable that the complement fixation test was the more accurate in remaining negative in these cases.

In the remaining 9 cases under consideration 4 more cases can be reasonably accounted for; 2 of these 4 cases were rated as *subacute* and had *positive* cultures. The other 2 were rated as older cases but still had *positive* cultures. All four of these patients responded well to treatment and made a *prompt* recovery and were considered *cured* on discharge. In these cases we believe that the gonorrheal infection was aborted before the complement fixation had time to develop. This we consider may be quite comparable to the early syphilis case, where with a prompt dose of salvarsan the Wassermann reaction never develops.

If this be the proper interpretation it will argue for the value of early treatment and complete rest in bed for these patients.

This leaves 5 cases of the 15 which are chronic in type with cultures or spread positive for the gonococcus, but with a negative complement fixation reading which we cannot entirely account for at this time. This group is receiving careful study.

In a group of 90 cases of "clinical gonorrhea" due to organisms other than the gonococcus, all were proved negative for the gonococcus by culture, spread, and complement fixation.

The various other organisms found on culture responsible for the clinical symptoms were listed on a preceding page one or more of these organisms were found in these nongonorrheal cases. Certain of these organisms were particularly interesting in their clinical manifestations as follows:

An analysis was made of a group of cocco-bacillus cases, and one of our most interesting discoveries was an organism which Dr. Williams has called a cocco-bacillus and whose morphology and cultural characteristics will be described in her paper.* Simulating the gonococcus in spread, it does not give the complement fixation reaction and differs in cultural characteristics.

Clinically, it gives a similar picture to gonorrhea but runs a shorter course. We have had five such cases uncomplicated with gonorrhea and

*See page 547.

the clinical findings have been as follows: one case was considered sub-acute, four cases were considered chronic, the urethra was involved in four cases, erosion of the cervix in three cases, and perimetritis was noted in four cases.

STREPTOCOCCUS INFECTION

Streptococcic infection of the pelvic organs in women is probably far more prevalent and less understood than we think. The usual conception is that it is due to complications of abortion and childbirth and that it travels by the lymphatic system and tends to cause a parametritis. All of which it does without a doubt.

However in this series the streptococcus seems to also play another rôle, namely that of an infection simulating gonorrhea and traveling as the gonococcus does by direct extension and giving rise to tubal infection and perimetritis.

It would seem that the streptococcus may be a primary infection without the gonococcus or may be a coexistent infection with the gonococcus.

In our series we had 108 cases which showed the presence of strepto-cocci. Of these 44 were cases without gonococcal infection. These cases come under the following classification.

CASES OF STREPTOCOCCIC INFECTION WITHOUT GONOCOCCUS

	ACUTE	SUBACUTE	CHRONIC	
Alpha	–	2	3	5
Gamma	–		12	12
Unclassified	–	5	22	27
				—
				44

CASES OF STREPTOCOCCIC INFECTION WITH GONOCOCCUS

	ACUTE	SUBACUTE	CHRONIC	
Alpha	2	4	6	12
Gamma		6	6	12
Unclassified	2	14	24	40
				—
				64

It is interesting to note that in the group where there was no evidence of gonococci, the majority of the cases (37 out of 44) were chronic in type, and it could easily be argued that these cases had started out with a co-existing gonococcic involvement but that this had died out leaving the more resistant streptococci.

Clinically the presence of streptococcus with the gonococcus suggests a graver prognosis. This is well shown in the two cases in the series which

came to laparotomy. In both of these cases there was a typical gonorrheal course with complement fixation readings up to 4+. Neither gave a history of recent childbirth or abortion. But when the symptoms became so urgent that operation could no longer be deferred culture showed the streptococcus to be the immediate cause of the symptoms and not the gonococcus. In one of these patients (who recovered), there was an enormous pyosalpinx, which gave a pure culture of streptococcus.

TRICHOMONAS VAGINALIS

In 200 cases of ''clinical gonorrhea,'' trichomonas was present in 70 cases or 35 per cent. Of these:

A. Trichomonas vaginalis only   3
B. Trichomonas and gonorrhea   26,   gonorrhea proved by either culture, spread or complement fixation.
C. Trichomonas with syphilis and gonorrhea   13
D. Trichomonas and other organisms   28,   gonorrhea not proved by culture, spread or complement fixation.

The association of trichomonas with other organisms was as follows:

Trichomonas with gamma streptococcus	8	
Trichomonas with alpha streptococcus	6	
Trichomonas with unclassified streptococcus	13	
Trichomonas with cocci bacilli	10	
Trichomonas with influenza	5	
Trichomonas with diphtheroids	21	
Trichomonas with catarrhalis group	1	
Trichomonas with bacillus coli	16	
Trichomonas with actinomyces and yeast	9	
Trichomonas with gram-positive bacilli	9	
Trichomonas with gram-negative bacilli	16	
Number of pregnancies in 200 cases	11	
Number of trichomonas in pregnant cases	6	54.5%
Total number of cases admitted for months June, July and August	81	
Trichomonas	36	44.4%
Total number of cases admitted for months October, November and December	65	
Trichomonas	18	27.6%
This shows a greater percentage of trichomonas in summer months		

ACTINOMYCES

On this present series we had 13 cases which did not give any very outspoken symptoms. However, I am taking the liberty of recording two cases of similar infection not on this immediate series where the clinical picture was very marked. Both of these cases had gonorrhea and syphilis, but not in the active stages. In Case 1 an intercurrent infection came on very suddenly, which on first observation looked like diphtheria. There

was a tenacious creamy white membrane which involved the cervix, urethral orifice and Bartholin's ducts. The case was quickly proved not to be diphtheria, and at the height of the infection streptothrix was found in the exudate. The urgent clinical symptom was the early and alarming necrosis of the cervix, large pieces sloughing away, making a large, gaping cervical orifice. Similar condition of necrosis occurred around the urethral and Bartholin's ducts. All of these areas finally healing by granulation, with considerable loss of tissue. This first case responded very well to potassium iodide by mouth in addition to local antiseptics. The second case was in all ways similar to this first, but less intense in type.

The Bacillus coli communis was found by culture in 31 cases, 13 of these were associated with the gonococcus and 18 were not.

The majority of these cases were chronic in type, and did not show any outstanding clinical symptoms, with the exception of one case of granuloma inguinale.

The influenza bacillus was found by culture in 10 cases. One of these was subacute, the others were chronic.

There were six cases in the catarrhalis group, but Dr. Williams reported that they were not the classical catarrhalis organism. The cases showed urethritis and cervicitis, and cleared up rapidly. There were 1 acute, 2 subacute cases, and 3 chronic cases.

After a study of the foregoing cases it becomes obvious that many cases of so-called "clinical gonorrhea" are in fact not gonorrhea at all. Possibly one reason that some of the cases have been so diagnosed is due to the time honored tradition that there are certain pathognomic physical findings that can be relied upon as gonorrheal. It is little more than a decade ago that leading gynecologists would state that an infection of Bartholin's or Skene's gland were "almost unmistakable stigmata of gonorrhea." Undoubtedly much injustice has been done to patients because of this, and probably many an important diagnosis has been overlooked as a result.

It becomes more apparent as research on the infections of the female pelvis progresses, that it is impossible to claim any unmistakable stigmas of gonorrhea. Too many other organisms can give the identical clinical picture. Thus if the coccobacillus, catarrhalis, etc., can give an acute profuse urethritis, the streptothrix acute inflammatory symptoms of the Bartholin ducts and even an abscess of the Bartholin glands, and an acute cervix may be due to any of these and a number of other organisms as streptococcus, etc., it behooves us to realize that we can claim none of these as definitely due to the gonococcus.

Requirements for discharge of female gonorrheal patients, include (1) A negative clinical picture; (2) two consecutive series of negative spreads, taken one week apart, one to be immediately postmenstrual; and (3) a negative or weakly positive complement fixation reaction.

For a statement as to *final cure* we believe the above negative findings should persist for a period of six months.

While the foregoing requirements for discharge of patients has furnished a practical working basis, it has been one of the definite aims of this research to find ways and means of proving that the cases of gonorrhea which are apparently cured, and giving negative complement fixation reactions are really cured or not.

The object then in isolating and studying strains of gonococci was to find strains that contain inclusive antigens, in other words, major strains, that would help in the complement fixation test to detect more cases, and that would help make vaccines that might be more active. A preliminary study was started in regard to the effect of such vaccines on the complement fixation curve, and its significance in determining cure. We are hoping to continue these studies.

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SPECIFIC BACTERIAL CERVICITIS*

Anna W. Williams, M.D., and Norma C. Styron, New York City

(From the Bureau of Laboratories of the Health Department)

THIS paper is a report of a bacteriologic study of about two hundred cases of cervicitis sent to the Venereal Service of Dr. Emily Barringer in the Department of Hospitals, New York City. The women were sent in as "first offenders" through the "night court," and the majority came in with the diagnosis "clinical gonorrhea," since only 44 of them (see Table I) showed a "positive" spread in the "night court" clinic.

After entering the hospital, cultures, spread, and complement fixation were studied at regular periods throughout their stay.

Technic of Cultures.—The material was collected on a slender, moist sterile swab, from within the cervix after preliminary cleansing with sterile cotton. The swab was rubbed over the surface and plunged into the depths of semisolid medium in the test tube. The best medium for isolating the gonococcus, we have found to be a "vitamin-agar" base with a 5 per cent potato extract and a 2 per cent glycerin. An addition of 10 per cent horse serum may improve the medium a little.

The inoculated tubes were carried to the laboratory (which took about one hour) and cultures were made on plates of the same medium, also on standard blood agar

plates and in meat broth. The original tube and all of the other cultures were incubated at 37° C. for about twenty-four hours, when the plates were examined and fished and sub-cultures were made from the meat broth and the original tubes.

The case incidence of our bacteriologic findings is summarized comparatively in Table I, together with the complement fixation, Wassermann, and trichomonas incidence.* This shows that large numbers of these cases have given no evidence of gonococcus infection. Nearly 50 per cent of these cases gave negative gonococcus cultures, spreads, and complement fixations

TABLE I

CASES ENTERING WITH DIAGNOSIS : "CLINICAL GONORRHEA"

Laboratory Findings*		Spreads Positive		Spreads Negative				Totals
		Acute	Subacute	Chronic	Acute	Subacute	Chronic	
Gonococci	Cultures Pos.	‖‖‖‖‖		‖‖‖	‖	‖‖‖	‖‖‖‖‖		49
	Positive	‖‖‖‖‖ ‖		‖‖ ‖	‖‖	‖‖ ‖‖	‖‖ ‖‖		55
	DA		‖‖	‖ ‖	‖‖	‖	‖ ‖‖‖		21
	+	‖‖‖‖ ‖‖‖ ‖‖ ‖‖		‖‖ ‖ ‖‖ ‖	‖	‖ ‖ ‖ ‖‖‖‖‖‖‖		64
	±cont.	‖	‖ ‖	‖‖ ‖‖	‖	‖ ‖	‖‖ ‖ ‖ ‖‖ ‖‖‖		32
	Catarrhalis	‖	‖	‖		‖	‖ ‖		6
	Cocco-Bacillus	‖‖	‖ ‖			‖ ‖	‖ ‖ ‖‖		10
Gram-Bacilli	Coli Group		‖‖		‖‖	‖ ‖‖	‖ ‖ ‖‖ ‖‖‖ ‖‖ ‖‖‖‖‖		31
	Influenza		‖		‖	‖‖‖ ‖‖‖ ‖	‖		10
	Others	‖‖ ‖ ‖‖‖‖		‖‖ ‖ ‖‖ ‖ ‖‖‖‖	‖‖ ‖‖ ‖‖ ‖‖‖‖‖ ‖‖ ‖ ‖‖‖‖		68
Irregular Streptococci	Actinomyces	‖‖	‖‖ ‖	‖ ‖ ‖	‖	‖	‖ ‖		13
	Yeast		‖‖ ‖	‖ ‖ ‖‖	‖ ‖	‖ ‖	‖		15
	Alpha	‖	‖‖‖	‖	‖ ‖ ‖ ‖	‖‖ ‖‖ ‖‖‖	‖‖ ‖ ‖ ‖ ‖‖ ‖‖		33
	Gamma	‖‖‖ ‖ ‖‖	‖‖			‖ ‖‖ ‖ ‖ ‖‖‖‖		18
	Unclassified	‖‖ ‖‖ ‖‖‖‖ ‖‖‖‖‖ ‖ ‖‖‖	‖ ‖ ‖‖ ‖ ‖‖‖ ‖	‖ ‖‖‖ ‖ ‖‖‖ ‖‖ ‖‖‖ ‖‖ ‖‖‖‖		58
Gram+ Bacilli	Diphtheroid	‖‖‖ ‖ ‖ ‖‖‖ ‖ ‖‖‖	‖ ‖ ‖‖ ‖‖‖ ‖‖‖	‖‖‖‖‖ ‖	‖‖‖ ‖ ‖ ‖‖ ‖‖‖ ‖‖ ‖‖ ‖‖‖‖ ‖‖ ‖ ‖‖‖‖‖		76
	Others		‖‖ ‖‖ ‖		‖ ‖ ‖ ‖‖	‖ ‖	‖ ‖ ‖‖‖ ‖‖‖ ‖		26
	Trichomonas	‖	‖ ‖‖‖ ‖	‖‖ ‖	‖ ‖ ‖‖ ‖‖ ‖‖	‖	‖‖ ‖‖ ‖‖ ‖‖‖‖ ‖ ‖ ‖‖‖‖ ‖ ‖‖ ‖‖ ‖ ‖‖‖ ‖‖		58
	Wassermann+	‖	‖ ‖	‖	‖ ‖	‖‖ ‖‖ ‖ ‖	‖‖‖ ‖‖‖ ‖ ‖‖‖‖‖‖ ‖‖‖‖‖‖‖ ‖ ‖‖‖‖ ‖ ‖ ‖ ‖‖		51
	Total Cases	3	24	17	8	44	109	

*Laboratory Findings—Spreads Positive—Spreads Negative—refer to the diagnosis made *before* admission to the Kingston Ave. Hospital, all other findings on Table I refer to findings *after* admission to the hospital.

throughout their course of from one to three months in the hospital. Among the other bacteria found, several species have given evidence of being the cause of the cervicitis; an occasional catarrhalis, a few from the coli group, several among the other gram-negative bacilli, one influenza bacillus among the ten found, an occasional species from the actinomyces and yeast groups, several among the streptococcus, staphylococcus, diphtheroid, and other gram-positive bacillus groups. Of course, several of

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*In Table I the chief organisms and other findings are indicated by a line opposite the name of the finding. The combinations of findings in each case are seen by reading up and down.

these microbes in association were no doubt responsible for a number of the cases of cervicitis.

Several groups of microbes may each give in stained spreads a microscopic picture which is difficult and sometimes impossible to differentiate from that of a "DA" (suspicious) or even a "positive" gonococcus.

Chief among these confusing microbes is a group of "coccobacilli"; next is the catarrhalis group including all the gram-negative diplococci other than the gonococcus; then come certain gram-negative forms of streptococci and of gram-negative bacilli (see Table II).

TABLE II. SOME POINTS OF DIFFERENTIATION BETWEEN THESE FORMS AND THE
GONOCOCCUS IN SPREADS

	DIFFERENTIAL CHARACTERISTICS	GONO-COCCI	COCCO-BACILLI	CATAR-RHALIS	GRAM-NEGATIVE STREPTOCOCCI
Staining	Even and intense	+			
	Somewhat irregular		+	+	+
Shape and Arrangement	Biscuit shaped diplococcus	+	±	±	±
	May also be rounded and bacillar forms		+		
	Rounded forms more frequent			+	+
	Rounded, oval and streptococcus forms also		±		+
	Intracellular capsular space	++	+	±	−

Coccobacilli.—Coccobacilli having some points in common have been isolated from ten cases. Only two of these strains seem to be alike in all particulars. In pure young cultures they are all gram-negative, nonmotile, indol-negative irregular organisms, showing a capsular space in their more or less mucoid growth, and a marked tendency to produce diplococcal forms, some of which strongly resemble the coffee-bean gonococci. Injected in large amounts into the peritoneal cavities of mice, some have shown more or less typical intracellular diplococci. The more or less purulent peritonitis following these large doses rapidly clears up. They produce no change in Russel's medium and none, or a slight alkaline reaction in milk. They grow slowly at room temperature, more rapidly at 36° C. Our studies, so far, of these forms seem to point to a relationship to the achromobacter group, or possibly to the actinomyces group. Only one of them gave definite evidence of being the chief cause of the cervicitis.

Catarrhalis Group.—Only six strains classed in the catarrhalis group were isolated and none of these were the classical catarrhalis.

Influenza Group.—Nine of the ten hemoglobinophile bacilli found were in chronic cases. This is significant when we remember that influenza bacilli have so often been incriminated as producers of chronic inflammation.

Gram-Negative Bacillus Group.—(Other than influenza and coccobacilli.) These comprised one of the largest of the four largest groups found (the others being streptococci, diphtheroids, and staphylococci) and among them the genus Escherichia occurred in the vast majority of the cases, the coli with its variants 45 times and the others 22 times. Of the others in this group, alkaligines occurred 16 times (no Brucella), Klebsiella 9 times, Aerobacter 4 times, Salmonella 3 times, and Eberthella 2 times.

Of these Salmonella morgani was found repeatedly in a case of granuloma inguinale and was possibly the chief cause of the condition.

Streptococcus Group.—Among the vast number of streptococci found not one proved to be Beta hemolytic. In the only two cases of peritonitis we had in this series, both showed a pure abundant culture of streptococci, one alpha hemolytic (St. equinus), and the other of the Gamma type (St. anhemolyticus). Many of the strains classed as Alpha hemolytic streptococci show the Delta type characteristics similar to those described by Bryant. According to Holman's carbohydrate types the great majority of the Alpha strains already classified, fell into the equinus and the fecalis groups.

The Staphylococcus Group.—These were mostly aureus and were found in many cases that cleared up rapidly, indicating slight if any pathogenic effects.

The Diphtheroids and Other Gram Positive Bacilli.—Evidence as to the pathogenic effects of members of this group was for the most part lacking. In a few cases some varieties persisted for a time in such large numbers as to throw suspicion on them as a cause of the inflammation; but these cases all cleared up comparatively quickly.

Döderlein's Bacillus.—Most of the cases in this series, as they cleared up, gave a striking morphologic picture of the presence of Döderlein's bacillus to the exclusion of all other bacteria in an apparently normal cervical canal. This corroborates the findings of others.

These studies have conclusively demonstrated that nongonorrheal cervicitis caused by one or more bacteria other than the gonococcus is common, and that since several groups of bacteria may give a "DA" (suspicious) or even a positive (gonococcus) picture in stained spreads, the morphologic and staining limits of the gonococcus should be thoroughly known by those employed to determine the morphologic identification of this organism, and when possible the morphologic stained spread picture should be checked by cultures and complement fixation.

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Obstetrical shock is the name applied to the usual manifestations of shock following delivery in which such causes as hemorrhages, heart disease, embolism, liver and kidney disease, operative procedures for delivery, too forceful Credé expression of placenta, inversion, anaphylaxis, etc., can be ruled out. Between 1921 and 1930, out of 24,800 deliveries at the Kermauner clinic, 6 cases are recognized as falling within this category. They all showed a striking similarity to secondary wound shocks. The collapse manifestations, preceded by a latent period, a wound (in the obstetrical case the placental site), an increased tendency towards its production by bleeding or anesthesia, and the same therapy for both, all tend to prove that the obstetrical phenomenon is the same as the traumatic.

The author believes that the shock is brought about by the formation through complex proteolytic processes of toxic substances (aminoacids) at the placental site which perhaps are decarboxylized to form histamin, the latter acting upon the liver producing portal vein obstruction, which in turn causes defective filling of the right side of the heart to account for the shock. Treatment with salt solution, hypertonic glucose, or transfusion tends to overcome this liver blockade to restore conditions to normal.

FRANK SPIELMAN.

A BACTERIOLOGICAL STUDY OF TECHNICS FOR TAKING VAGINAL AND CERVICAL CULTURES

FRED L. ADAIR, M.A., M.D., G. M. DACK, PH.D., AND E. M. J. LONG, M.S., CHICAGO, ILL.

(From the Departments of Obstetrics and Gynecology and Bacteriology of the University of Chicago)

NO SINGLE technic has been generally accepted for making cultures from the vagina and cervix. The lack of agreement between workers as to satisfactory methods for securing cultures, together with the multiplicity of organisms reported in the literature, suggests that none of the methods is entirely satisfactory. The difficulty in evaluating the significance of organisms found in the vagina and cervix is due to the possibility of their being normal residents of the anal-perineal region of the body that are carried up when the cultures are taken. In order to appraise the various technics, a nonpathogenic organism uncommon to the anal-perineal region and readily identified because of its pigment-producing powers was swabbed on the fourchette and fossa navicularis when the labia were spread apart. Cultures were then immediately taken, employing one of the various recommended technics.

Bacillus prodigiosus is found commonly in water and dairy products and forms a deep red pigment when grown on dextrose agar at room temperature. According to Harris and Brown,[11] it is not pathogenic to man. This has been confirmed in the 88 cases studied in this series. In preliminary experiments with 28 cases not listed in the tabulations, the vaginal walls, cervix, and os were examined, but B. prodigiosus was not found. In addition, thirteen tabulated cases were cultured for B. prodigiosus, with negative results. In the cases examined, B. prodigiosus was not found to be a normal inhabitant in either the normal or diseased genital tract of woman. When the organism was placed in the tract it disappeared within twenty-four hours.

The women studied were either gynecologic or postpartum patients who presented themselves for examination or treatment at the Max Epstein Clinic of the Chicago Lying-in Hospital. The ages of the patients ranged from nineteen to fifty-seven years. Most of the women were married, but a few were single. Apparently age and marital status did not influence the results.

The general method used was as follows: B. prodigiosus was grown on dextrose agar slants at room temperature. A small portion of the growth was transferred to 10 c.c. of sterile 0.85 per cent NaCl solution by means of a sterile swab. One slant made six and sometimes eight suspensions. The patient was placed in the lithotomy position and a swab dipped into this suspension was gently applied either to the vulva or to the fourchette and fossa navicularis, or to all three, depending upon the technic to be tested. All instruments were wrapped in heavy wrapping paper, rolled in towels, and sterilized. The invaginated rubber tubes were rolled in talcum powder, and the paper was sprinkled with it in order to prevent sticking.

Two general methods for making vaginal, cervical, and intrauterine cultures have been described in the literature.[1 to 15] In the first method, an instrument, such as a speculum, is used to open the vagina and the surface of the vagina or cervix is then cultured. The second method involves the use of a glass tube, or a similar device, which protects the swab or inner tube from contamination during insertion.

Since Bigger and FitzGibbon[6] have already called attention to contaminations encountered in using unguarded instruments, we felt that the reliability of the results with guarded apparatus should be further tested. The guarded instruments used were of five general types, as follows:

1. A glass tube, about one cm. in diameter, was plugged at one end with cotton; this plug was attached to a wire that was drawn through the tube. The tube, with wire and cotton plug, was sterilized. After swabbing the fourchette and fossa navicularis with the suspension of B. prodigiosus, the plugged end of the tube was introduced into the vagina. The wire was pushed forward to drive out the cotton plug and a sterile swab was introduced into the vagina through the glass tube, care being taken not to touch the sides of the tube. After the sample was taken the swab was carefully withdrawn and smeared on the dextrose agar plates. The results are shown in Table I (Cases 1 to 3).

2. A glass tube, about 6 mm. in diameter, was drawn out at each end and placed in a larger glass tube. The larger tube was plugged at one end with a cotton stopper to which a piece of strong thread was firmly attached. The inner tube was calibrated so that when it was pushed through the larger tube it could be stopped 6 mm. beyond the end of the larger tube. When the inner tube was drawn out, the tip did not come in contact with the walls of the larger tube. After the apparatus thus assembled was sterilized, a sterile syringe was attached to one end of the inner tube by means of a short rubber hose. The fourchette and fossa navicularis were swabbed with B. prodigiosus culture. The plugged end of the larger tube was introduced into the vagina, the cotton plug pushed out by gentle pressure on the inner tube, and suction applied to this tube with the syringe. The tube was withdrawn and the lip of the capillary tube was flamed before removing the sample from it for streaking on dextrose agar plates. The results are shown in Table I (Cases 4 to 7).

TABLE I.   COTTON-PLUGGED TUBES USED FOR SECURING VAGINAL AND CERVICAL CULTURES

CASE	APPARATUS USED	B. PRODIGIOSUS
1	Wire cotton plug and swab	+
2	Wire cotton plug and swab	+
3	Wire cotton plug and swab	+
4	Cotton plug on string—suction tube	+
5	Cotton plug on string—suction tube	+
6	Cotton plug on string—suction tube	−
7	Cotton plug on string—suction tube	+

3. A method was tried which combined the good points in the technics for cervical culturing described by Burt-White and Armstrong,[12] and White.[13] Two glass tubes were used, one fitting inside the other. The inside tube contained a sterile swab. The corresponding end of each tube was sealed separately by dipping in collodion. The assembled apparatus was sterilized in an autoclave at 18 pounds' pressure for thirty minutes. Longer autoclaving caused the collodion tips to break off. After swabbing the fourchette and fossa navicularis with a culture of B. prodigiosus, the outer tube was inserted in the os, in most cases (in the vagina in a few), the inner tube was pushed

TABLE II. USE OF DOUBLE GUARDED COLLODION TIPPED SWABS FOR SECURING
VAGINAL AND CERVICAL CULTURES

CASE	SPECULUM	CULTURE	APPARATUS USED	TREATMENT BEFORE TAKING CULTURES	B. PRODIG-IOSUS*
14	Used	Os Cervix	Double guarded collodion tipped tubes	–	+
15	Used	Os Cervix	Double guarded collodion tipped tubes	Cervix cleaned with sterile cotton pledgets	+
16	Used	Os Cervix	Double guarded collodion tipped tubes	Cervix cleaned with sterile cotton pledgets	–
17	Used	Os Cervix	Double guarded collodion tipped tubes	Cervix and fourchette cleaned with sterile cotton pledgets	+
18	Used	Os Cervix	Double guarded collodion tipped tubes	–	+
19	Used	Os Cervix	Double guarded collodion tipped tubes	–	+
20	Used	Os Cervix	Double guarded collodion tipped tubes	–	–
21	Not used	Vagina	Double guarded collodion tipped tubes	–	+
22	Not used	Vagina	Double guarded collodion tipped tubes	–	+
23	Used	Anterior lip of cervix	Double guarded collodion tipped tubes	–	+
24	Used	Os Cervix	Double guarded tubes —open both ends	–	–
25	Used	Os Cervix	Double guarded tubes —open both ends	–	+
26	Used	Os Cervix	Double guarded tubes —open both ends	Cervix cleaned with sterile cotton pledgets	+
27	Used	Os Cervix	Double guarded tubes —open both ends	Cervix cleaned with sterile cotton pledgets	+

*B. prodigiosus was swabbed in the fossa navicularis and vestibule.

in, breaking the collodion tip off the outer tube, and, lastly, the swab was inserted still further, breaking the collodion end of the smaller tube. The tubes and swab were withdrawn in reverse order. Dextrose agar plates were inoculated from the swab. The results of these experiments are shown in Table II.

4. A series of experiments was carried out with an inner suction tube similar to that described in type 2. The outer guard tube, in one series of experiments in which cervical cultures were taken, was sealed at one end with collodion. In another series of experiments in which vaginal cultures were taken, one end of the outer tube contained a snugly fitting thin rubber tube which could be invaginated in the larger tube. This rubber tube was made of thin rubber sewed together. The stitch holes were sealed with collodion, which was also used to seal the rubber tube tightly to the larger glass tube. Talcum powder was used to keep the rubber from sticking following sterilization. The apparatus was sterilized in an autoclave at 18 pounds' pressure for thirty minutes. After swabbing the fourchette and fossa navicularis with B. prodigiosus, cultures were taken in a manner similar to that described under the second type of apparatus. The inner tube, when pushed out, evaginated the rubber tube, and was calibrated to extend not more than 3 mm. beyond the end of the rubber tube. The results of these experiments are listed in Table III.

TABLE III. SUCTION TUBES FOR OBTAINING VAGINAL AND CERVICAL CULTURES

CASE	APPARATUS USED	CULTURE	B. PRODIGIOSUS
8	Collodion tipped outer tube	Cervix	+
9	Collodion tipped outer tube	Cervix	+
10	Collodion tipped outer tube	Cervix	+
11	Collodion tipped outer tube	Cervix	+
12	Invaginated rubber tipped outer tube	Vagina	+
13	Invaginated rubber tipped outer tube	Vagina	−

5. An appliance devised by Harris and Brown[11] more closely approached the ideal type than any other described. It consisted of two glass tubes, one within the other. A rubber cylinder, made of ordinary thin rubber glove stock, measuring about 120 mm. in length and 7 mm. in diameter and open at both ends, is drawn over 30 mm. of one end of the outer tube in such a way that 45 mm. projects beyond the end of the glass tube. The rubber is invaginated into the inner glass tube. A cotton swab on an ordinary applicator stick is placed within the inner tube. In taking cultures the labia were parted as widely as possible. The rubber-covered end of the outer tube was gently placed within the introitus, care being taken to avoid pushing it up into the vagina. The inner tube was pushed in, causing the rubber cylinder to emerge gradually and unfold until the free end of the inner tube slipped through and well up into the vault of the vagina. The applicator stick was then pushed in until the swab came in contact with the vaginal wall. The stick and swab were then withdrawn, with the tube still in place.

An attempt was made to duplicate the Harris-Brown technic. Table IV is a record of the results obtained. Using this technic, B. prodigiosus was

TABLE IV. USE OF INVAGINATED RUBBER-CAPPED TUBES FOR OBTAINING VAGINAL CULTURES (HARRIS-BROWN TECHNIC)

CASE	SUSPENSION OF B. PRODIGIOSUS	B. PRODIGIOSUS SWABBED ON	LABIA	B. PRODIGIOSUS
28	Saline	Fourchette*	Spread	+
29	Saline	Fourchette	Spread	−
30	Saline	Fourchette	Spread	+
31	Saline	Vulva	Spread	−
32	Saline	Vulva	Spread	−
33	Saline	Vulva	Spread	−
34	Saline	Vulva	Spread	−
35	Saline	Vulva	Spread	−
36	Dextrose broth	Vulva and fourchette	Spread	+
37	Dextrose broth	Vulva and fourchette	Spread	−
38	Dextrose broth	Vulva and fourchette	Spread	+
39	Dextrose broth	Vulva and fourchette	Spread	+
40	Saline	Vulva and fourchette	Together	−
41	Saline	Fourchette	Together	+
42	Saline	Fourchette	Together	+
43	Saline	Fourchette	Together	−
44	Saline	Fourchette	Together	−
45	Saline	Fourchette	Together	−
46	Saline	Vulva	Together	−
47	Saline	Vulva	Together	−
48	Saline	Vulva	Together	+
49	Saline	Vulva	Together	+
50	Saline	Vulva	Together	−

*Fossa navicularis also included.

TABLE V. SMEARS FROM FOURCHETTE AND FOSSA NAVICULARIS STREAKED ON BLOOD AGAR PLATES

CASE	HEMOLYTIC	MORPHOLOGY (GRAM STAIN)
53	–	Gram-positive coccus
54	Hemolytic	Gram-positive coccus
	Hemolytic	Small gram-negative rod
	–	Gram-positive rod
	–	Gram-positive coccus
55	–	Small gram-positive coccus
	–	Large gram-positive coccus
	Hemolytic (green)	Gram-positive coccus
56	Hemolytic	Gram-positive coccus
	–	Small gram-negative rod
	–	Gram-positive coccus
57	–	Small gram-negative coccus
	Hemolytic (green)	Gram-positive coccus in chains
	–	Gram-positive coccus
	–	Gram-positive sarcina type
58	–	Gram-positive rod
	–	Gram-positive coccus
59	–	Large gram-positive coccus
	–	Small gram-positive rod
	–	Gram-positive coccus
60	Hemolytic	Gram-negative rods
	–	Small gram-positive rod
	–	Gram-positive coccus
	–	Small gram-positive coccus

found in 20 per cent of the cases when it was first swabbed on the vulva and the cultures taken without parting the labia. In no case was B. prodigiosus found when it was swabbed on the vulva and the labia were well parted. (This confirms the work of Harris and Brown.)   When B. prodigiosus was placed on the fourchette, this organism was found in 50 per cent of the cases; therefore, it was possible to avoid contamination from the vulva by parting the labia, but it was not possible to avoid contamination from the fourchette and fossa navicularis.

There was not much difference in the results when a broth culture of B. prodigiosus was used in place of the saline suspension, except that more colonies were observed on the plates when the broth culture was used.

Smears were taken from the fourchette and fossa navicularis of eight patients and streaked on blood agar plates in order to determine what part the fourchette and fossa navicularis might play in contaminating vaginal and cervical cultures. Abundant growths of many different species of organisms were found (Table V), which indicates that the fourchette and fossa navicularis contain a reservoir of organisms that may be carried up when vaginal and cervical cultures are taken.

DISCUSSION

Many organisms have been found in the female genital tract.   Pickett-Thomson,[16] in an extensive review, noted the following organisms described in a long list of reports:

Streptococcus pyogenes puerperalis, facultative anaerobic streptococci, facultative anaerobic diplostreptococci, Staphylococcus albus, bacteria of the coli group, pseudo-tetanus bacillus, B. aerogenes capsulatus, Streptococcus viridans, S. mitior, S. faecalis, Staphylococcus aureus, diphtheroids, yeasts, molds, pneumococcus, Micrococcus tetragenus, S. mitis, S. infrequens, S. equi, S. salvarius, S. equinus, C. welchii, Döderlein's bacillus, enterococci, gonococci, B. subtilis, and B. mycoides.

It may be possible that many of these organisms find their way into the tract from just such points as the fourchette and closely adjacent parts.

A simple experiment was made in an attempt to simulate physical conditions in the vagina which favor the carrying up of organisms. A very thin collapsible rubber tube was covered inside with a dilute soap solution and a drop of India ink was placed at one opening of the thoroughly collapsed tube. When a glass tube was introduced into the rubber tube, the India ink was carried along not only as far as the inserted tube but considerably farther. The result of this experiment was in agreement with the findings in the case of B. prodigiosus in the female genital tract.

SUMMARY

1. A bacteriologic study of the methods reported for obtaining vaginal and cervical cultures, using B. prodigiosus as an indicator, has shown that no method avoids the carrying up of this organism from the fourchette and fossa navicularis.

2. The appliance and technic of Harris and Brown, although the best method yet reported, did not prove to be entirely satisfactory.

3. It has been shown that the fourchette and fossa navicularis contain a rich bacterial flora which may be carried into the female genital tract when vaginal and cervical cultures are taken.

4. The results of these experiments with B. prodigiosus in the female genital tract indicate that organisms not only travel up but ahead of objects inserted in the tract.

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SPONTANEOUS AMPUTATION OF THE CERVIX DURING LABOR*

Edwin J. DeCosta, M.D., Chicago, Ill.

(From the Obstetric Service of the Cook County Hospital)

THE subject of spontaneous cervical amputation during labor was brought to our attention a few years ago by Dorsett of St. Louis. His brief report comprises the second contribution to this subject in American literature. I wish to present one more case and consider the literature which has been reviewed without sufficient thoroughness.

Mrs. L. T., primipara, aged eighteen, was admitted to the maternity ward of the Cook County Hospital on June 26, 1931, because of prolonged labor. Her menstrual history was normal, the last period being late in August, 1930.

There were no abnormal features during pregnancy until the onset of labor pains four days prior to admission. Pains were of moderate intensity, the membranes ruptured early, and progress was very slow. The day before admission she was given several capsules of quinine and a hypodermic of morphine by the attendant from an outpatient clinic.

Physical examination on admission revealed a small colored woman, who was restless, dehydrated, and obviously exhausted from a prolonged labor. Her temperature was 101°, pulse 100, and respirations 24. Head, neck, heart and lungs were essentially normal. The abdomen presented the appearance of a fullterm pregnancy; position, left occiput anterior, with the head deeply engaged. The fetal heart tones were audible in the left lower quadrant. The lower uterine segment was tender on palpation. Her pelvic measurements were: interspinous 22 cm., intercristous 24 cm., external conjugate 17, and the diagonal conjugate 11 cm. On rectal examination the cervix appeared completely dilated, the sagittal suture was in the right oblique, and the head was on the perineum.

The patient was prepared for delivery. Until this time there had been no vaginal bleeding. As the head distended the vulva, during uterine contractions, an edematous, purplish mass appeared in front of the head. This mass was lying free within the vagina and removed for further study. Shortly after, the patient gave birth spontaneously to a deeply asphyxiated male child weighing 2950 gm. The birth was followed by a gush of foul smelling amniotic fluid. The placenta separated spontaneously with slight hemorrhage. An hour later the child died. The right parietal bone overlapped the left and presented a large caput. The bitemporal diameter was 8 cm., the biparietal 9.5, the suboccipital bregmatic 9.7, the frontooccipital 11.5 and the mentooccipital 14 cm. Thus a normal sized baby had been born through a justo-minor pelvis.

Vaginal examination following delivery revealed an intact perineum and complete absence of a cervix. The vaginal and uterine cavities now formed a continuous canal. There was no bleeding from the cervical site. Immediately following delivery the temperature rose to 103.8° and the pulse to 110.

Except for a temperature of 100° on the fourth day associated with engorged breasts, her puerperium was afebrile, with the pulse ranging from 80 to 90. However she suffered from a mild paralytic ileus, edema of the vulva, and urinary incontinence during the first week, and on the eleventh day insisted on leaving the hospital.

Gross examination of the specimen revealed it to be an amputated cervix from a gravid uterus. Roughly it was a truncated hemisphere with the greater diameter 7 cm., the lesser diameter 3 cm., and the distance between the two from 4 to 6 cm. The color

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was deep purple, mottled with grey where the epithelium was macerated. Along the upper margin the tissue was thin, serrated and friable, while in the region of the external os it was smooth, firm, somewhat edematous, and 9 mm. thick.

In the section of tissue from the external os, stained with hematoxylin and eosin, there was loosening of the squamous epithelium with extensive extravasation of blood and edema of the underlying tissue. The majority of cellular elements had disappeared and only histiocytes, round cells and polymorphonuclear leucocytes were stained clearly. The vessels were widely distended with blood, in places their walls were broken and blood could be seen escaping into the interstitial tissue. A Weigert elastic stain failed to show definite elastic fibers. In a section from the proximal edge there were similar but more marked changes. To summarize, the pathologic findings were consistent with those of necrotic cervical tissue.

The patient was reexamined on Nov. 12, 1931, four and a half months after delivery. Menses had returned and were slightly prolonged, in addition she complained of dysuria and lower abdominal tenderness. On examination the perineum was found intact, the pelvic floor firm and elastic, and the pillars of the levators firm and functioning. On speculum examination a small portion of the anterior lip of the cervix still remained. The corpus was of normal size and in normal position, freely movable and not tender. The adnexa were normal.

The first recognized occurrence of spontaneous cervical amputation was reported in 1820, by Scott who attended a thirty-six-year-old primipara during prolonged labor. The patient he reports felt something suddenly give way in her pelvis, and after spontaneous expulsion of the cervix a living child was delivered by vectis. The mother made a stormy recovery.

In the case next observed, that of Carmichael, which was reported by both Powers and Ashwell in 1840, the fetus was delivered by embryotomy with the maternal course satisfactory.

From 1820 until the present time, including this case, I am able to find 32 references to complete spontaneous amputation of the cervix, occurring during labor. In 1923, Petterson reviewed the literature and reported 18 cases, analyzing 13 carefully. Of the 13, I have eliminated two, those of Meigs and Saniter, because of associated carcinoma of the cervix in the first instance, and placenta previa with a bag induction in the second. Stanca, in 1929, reported the occurrence of cervical amputation associated with a three month septic incomplete abortion. This case and all those attributed to bag induction or other instrumentation are not included in my series, nor are cases of incomplete or partial amputation. Sufficient information is available in 17 cases for study. As will be noted later 13 of these were associated with operative deliveries, and may be questioned as resulting from forceps or embryotome trauma. Thus only 3 other cases of undoubted complete amputation of the cervix, occurring during the course of spontaneous delivery (those of Levy, Johnston, and Kiwisch), are reported in the literature.

The first report of spontaneous cervical amputation in American literature is that of Johnston in 1851, and the second, that of Dorsett in 1927.

In fifteen instances the age of the patient is known, varying from 18 to 42, 50 per cent being under thirty-five years of age.

Fifteen or 88 per cent were primigravidae, the remaining, secundigravidae.

In 14 cases, where the time of rupture of the membranes was reported, 11 occurred

before or at the onset of labor. And only once, the case of Essen-Möller, is the rupture definitely known to have occurred late in labor.

All were cephalic presentations and in four instances, where the weight of the fetus was given, the average was 3510 grams (7.7 pounds).

More interesting perhaps, are the types of pelves. In two instances they are noted as normal and in five, flattened or generally contracted. However the possibility of disproportion in the normal pelves must be considered until we are acquainted with the size of the fetal head. Unfortunately the latter information is not available, although the head is in some cases mentioned as large.

Generally the pains were strong, nevertheless Futh and Koch employed pituitrin and Powers ergot to stimulate contractions. In these cases it becomes difficult to evaluate the rôle played by the oxytocic. In spite of adequate pains, labor was prolonged, varying from thirty to one hundred and eight hours, with an average duration of sixty-three hours. As already noted spontaneous delivery occurred only four times, while forceps were employed eight times, vectis once, and embryotomy twice.

The prognosis for the fetus is bad; a high morbidity and 40 per cent mortality. The maternal mortality was 11 per cent. Bladder complications are reported three times. Bleeding prior to delivery is reported in two instances and was not of serious proportions. The majority, 80 per cent, were reexamined at various intervals during the puerperium and none showed serious complications. The cervix was either completely missing or a small portion of lip remained. In every case the uterine os had contracted down to normal size.

In the case of Staude, the patient became pregnant subsequently but aborted at two months, however, both Hirst and Johnston report a normal fullterm delivery occurring one year after spontaneous cervical amputation.

Is it correct to assume that some abnormal degree of cervical rigidity is the causative factor in spontaneous amputation of the cervix? If so, what is the cause of this rigidity? Is it not perhaps more a matter of faulty mechanism of labor, in which the cervix is unable to dilate normally?

In his consideration of transverse cervical tears, Schauta in 1880, pointed out that in primiparas especially, the external os is carried closer to the promontory of the sacrum than the symphysis, and with the descent of the head, the anterior cervical wall is under greater strain than the posterior. If dilatation does not follow, this strain may cause the weakened longitudinal fibers to give way with a resulting transverse cervical tear. In addition he mentions the supplementary effect of pressure in weakening the fibers, already under strain. However in most of the cases, descent of the head occurred late and it appears that the pressure effect is paramount rather than the failure of the cervix to dilate.

I wish to emphasize the importance of early rupture of the membranes in the development of this injury. Normally during the first stage we consider cervical dilatation dependent largely upon upward traction of the long fibers and downward pressure of the bag of waters. With removal of the hydrostatic effect of the bag of waters there is more pressure exerted upon the fetus than usual with consequent advancement, and now dilatation is partially due to direct pressure of the head. If disproportion is present the effect of this pressure may be manifested by injury to the cervical wall. Pressure effects on the cervix are frequently noted, although rarely does this go on to the extremes included in the case here re-

ported. A deflexed attitude, the usual accompaniment of a flattened pelvis, possibly adds to the degree and uniform distribution of the pressure and accounts for complete circular injury.

Thus the cervix becomes pinched between the skull and the pelvic wall, and retraction as the head descends, is greatly interfered with. Circulation is obstructed leading to engorgement, edema and finally devitalization of the cervix. The latter causes a relative rigidity that makes subsequent dilatation impossible. Necrosis soon follows and the cervix is separated from the lower uterine segment. Hence the amputation occurs during the first stage of labor, but at a period when normally labor should have progressed to the second stage.

Couvelaire considered that leucocytic infiltration, noted frequently on microscopic section, was indicative of preexisting inflammation of the cervix, which in turn was responsible for rigidity. Others have maintained that there is an absence of the normal elastic fibers and an abundance of connective tissue. Both the infiltration and apparent absence of elastic tissue may be explained by the necrotic changes that have occurred. On the other hand we constantly encounter normal deliveries in patients with badly infected cervices and in elderly primiparas, in whom we expect to find a scarcity of elastic fibers. Again Weimann, in a case of partial amputation, has observed both the normal amount and distribution of elastic tissue. It will be noted that all specimens described presented some dilatation of the external os and effacement of the internal. The fact that dilatation was able to progress to a certain point speaks against an inherent rigidity.

The length of the cervix is an important predisposing factor, and the case of Futh serves to illustrate this point. When he examined his patient several weeks after delivery a goodly portion of the cervix was still present, in spite of the fact that a large annular piece of cervix was amputated prior to delivery.

To prevent this complication of labor two methods have been recommended for consideration; they are mechanical dilatation and radial incisions of the cervix. Mechanical dilatation either manual or instrumental is not justifiable, since this procedure upon an already devitalized friable cervix can lead only to more serious injury and subsequent infection. Radial incisions may expedite delivery, but whether the cervix can be preserved will depend upon the pressure injury already sustained.

The presence of fragments of necrotic cervix is a menace to the puerperium and some authorities advise removal of incompletely separated or incised cervices on this basis. When the complete amputation has occurred the treatment is expectant conservatism.

In conclusion, spontaneous amputation of the cervix is a complication of labor dependent upon some degree of disproportion between the fetus and pelvis, an early rupture of the membranes, and possibly a long cervix. Preexisting rigidity of the cervix may be a factor but probably is less important than heretofore stressed.

The pressure exerted directly on the cervix leads to obstruction of circulation, edema, necrosis and secondary rigidity.   As the head finally moulds through the pelvis the undilated cervix is carried before it and gradually, the already injured and devitalized tissue is separated from the normal.

Postpartum complications, either from hemorrhage, pressure, or infection occur infrequently.

If, as I have endeavored to show, spontaneous amputation of the cervix is dependent upon disproportion rather than cervical dystocia, early recognition and proper management of the disproportion will obviate this complication.

We have insufficient data to determine whether the effect of amputation of the cervix during labor has any different effect on the course of subsequent pregnancies than a high gynecologic amputation.   However normal

TABLE I

AUTHOR	AGE	GRAV.	LABOR	HEMORR.	RUPTURE OF B OF W	CHILD	RESULTS
1. Scott 1821	36	1	39 hr.	mod.	onset	live vectis	stormy course reexam.
2. Powers 1840	young	1	48 hr. ergot	....	....	dead crotchet	good reexam.
3. Lever 1845	23	1	96 hr.	....	onset	dead crotchet	dead sepsis
4. Levy 1851	35	1	96 hr.	none	before	dead	good
5. Reardon 1851	..	2?	30 hr.	present	....	live	good incised
6. Johnston 1851	30-35	1	35 hr.	none	early	dead	good
7. Staude 1872	26	1	48 hr.	none	after 12 hr.	dead forceps	good reexam.
8. Kiwisch 1872	40	1	..	....	....	?	dead peritonitis
9. Lohlein 1881	38	1	54 hr.	....	early	live forceps	good
10. Wainstein 1902	31	2	..	none	late	? forceps	good reexam.
11. Deutsch 1914	42	1	84 hr.	none	early	live forceps	good reexam.
12. Futh 1923	24	1	48 hr. pituitrin	....	before	live forceps	good reexam.
13. Essen-Möller 1923	38	1	108 hr.	none	late	live forceps 4000 gm.	good reexam.
14. Koch 1925	42	1	34 hr. hypophysin	....	during	live forceps 3880 gm.	good reexam.
15. Cathala 1926	26	1	62 hr.	....	before	live forceps 3210 gm.	fair pubiotomy reexam.
16. Dorsett 1927	20	1	48 hr.	none	before	dead forceps	good reexam.
17. 1931	18	1	96 hr.	none	early	live 2950 gm.	good reexam.

pregnancy occasionally follows, probably occurring in those cases in which the integrity of the internal os has not been destroyed.

Other references to complete spontaneous cervical amputation appear in the Rotunda Hospital Reports of 1840, and in the various reports of Arrivé, Bonnaire, Boshauwer, Boudreau, Bouffé de Saint-Blaise, Crespin, Kennedy, Porak, Stamberger, and Wallich. Detailed information concerning these cases was not available, and, therefore, they are not included in my survey.

NOTE: Acknowledgement is made to Dr. D. A. Horner for his courtesy in permitting me to report this case.

ADDENDUM

On March 5, 1933, the above patient returned to Cook County Hospital complaining of irregular cramps in the abdomen. Examination revealed a full term pregnancy with head floating over the inlet. In view of the previous disproportion and scarred remains of a cervix, a cesarean section was considered as the most satisfactory method of delivery.

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ABSTRACT OF DISCUSSION

DR. RUDOLPH W. HOLMES.—I have seen two annular ruptures of the cervix. I believe with Dr. DeCosta that spontaneous rupture is probably largely dependent upon pressure in that usually the complication occurs in cases of contracted pelves: but it is only part of the story. Annular ruptures occur at or below the uterovaginal attachment almost invariably if my recollection of the literature is correct. Annular rupture does not occur after dilatation has become completed, but when partial dilatation is present, i. e., the great contributory factor is rigidity of the cervix.

Some twenty years ago I presented a case of a para 1, in whom there was a failure to dilate so I introduced a bag within the uterus. The bag was expelled but remained attached within the vagina, as the bag had been extruded through a rent in the posterior cervical wall. The tube was released and the baby was borne through the rent. Postpartum examination showed that the cervix was merely held by a small isthmus of tissue which was severed. The patient recovered uneventfully. That there might not be atresia about ten days later I stitched into the cervical canal a glass tube with multiple perforations: after a week the tube was removed. Some two or three months later she

returned to the hospital in a pitiable plight with all the molimina of menstruation but no flow: she declared the pain was worse than that of labor: accompanying the pelvic distress was an intense urticarial rash and itch. This continued the usual duration of her menstruation—three or four days. We tried to find the cervical canal but the scarring prevented it. The next month was a repetition of the previous menstrual attempt. I then performed a supravaginal hysterectomy. I rise particularly to give warning that my own experience teaches that atresia may be an unfortunate sequence of annular rupture.

In my second case I found on inspection tissue protruding from the vulva which looked like bowel, had the appearance of being strangulated. After thoroughly cleaning up the parts we found that the patient had an annular rupture just short of complete: this was removed with scissors. She had no ill consequence from the experience.

DR. A. F. LASH.—I saw this patient in the postnatal clinic up until the last four weeks. I found that the pelvic organs were entirely normal. As a result of our cauterization, the cervical lining which was protruding anteriorly, had disappeared and squamous epithelium had grown over, with a complete covering of the cervical stump. I believe there was ½ to ¾ cm. of the cervix still left. There was no pelvic infiltration. The broad ligaments and adnexa were perfectly normal and the uterus in perfectly good position. The patient was in good health and menstruating regularly.

DR. LOUIS RUDOLPH.—There is a question as to the stage of labor in which rupture takes place. The essayist states that it takes place during the first stage. Is it possible for sufficient pressure to be exerted on any part of the cervix during the first stage of labor to produce an annular rupture? During the first stage of labor effacement and dilatation is brought about by isometric contraction or retraction of the upper uterine segment with the ''uterine pull'' or fulcrum being situated on the fundus uteri which pressing onto that part of the fetal ovoid that is in the upper segment becomes the fixed point for the uterine changes in the first stage. The continued retraction of the upper segment brings about effacement and dilatation of the cervix by pulling upwards of the Ring of Bandl and the lower uterine segment. Therefore the canalization of the lower pole of the uterus is due to uterine changes. The second stage of labor is due to a change of the ''uterine pull'' or the fulcrum to the bony pelvis through the endopelvic fascia and the vaginal walls. It is only during the second stage of labor that the ovoid meets the resistance of the bony pelvis. The pathologic examination shows that necrosis had occurred, which means that the cervix must have been pressed onto the bony pelvis. If we take into consideration the physiology of the uterus in labor, it is more probable that the pressure necrosis occurred during the second stage, because the complete dilatation was not present on account of a possible cicatricial condition of the os externum. The cicatricial state of the os externum caused the upper segment to function normally, and with the second stage of labor, when the descent of the ovoid begins normally, the head was pressed against the pelvic inlet which led to pressure necrosis. Just because the os externum was not dilated does not signify the first stage of labor. The second stage of labor begins when the uterovaginal canal is formed, when a lip of cervix may be palpable but it is dilatable, and it is at this stage when descent and pressure of the presenting part of the fetus against the bony pelvis becomes manifested.

DR. DeCOSTA (closing).—The point I tried to emphasize is that preexisting cervical rigidity is not the chief factor involved. The specimen showed approximately 4 cm. dilatation. If the cervix were stenosed, would she have had any dilatation at all? In conglutinatio orificii externi there is definitely a stenosis of the external os and yet I know of no case associated with amputation of the cervix. The microscopic examination, likewise, shows no evidence of preexisting cervical rigidity.

Whether the rupture occurs in the first or the second stage, I cannot say. According to the accepted definition, since dilatation of the cervix was not complete I must assume that it occurred during the first stage.

THE ORAL ADMINISTRATION OF SODIUM AMYTAL IN LABOR
A Clinical Analysis of Two Hundred Fifteen Cases

D. T. Van Del, M.D., Kansas City, Mo.

(From the Kansas City General Hospital)

THE barbituric acid derivatives have been employed to relieve the pains of labor since 1926, and sodium amytal (iso-amylethyl barbituric acid) has been found to be the most active and least toxic hypnotic of the barbiturates.

The fatal dose of the drug has been established for some animals, but these results cannot be safely applied to man. The largest dose of the drug to be safely tolerated intravenously in man has been 25 grains and during labor this total amount has not been exceeded in this experiment.

Sodium amytal has been given orally to 215 patients, which were hospitalized, and no attempt at selection has been made. When regular pains occurred, accompanied by cervical dilatation, oral dosage of the drug was instituted. Of the total number of patients, 150 received amytal only, 50 were given one-sixth grain of morphine in addition to amytal, and 15, cesarean sections, received amytal, morphine and a local anesthetic of 1 per cent novocaine. In the first group, 75 patients received an initial dose of 9 gr. of amytal and in about three hours, as labor advanced, 6 gr. additional was given. The initial dose for the remaining 75 was 15 gr. followed by an additional 6 gr. of amytal later in labor. In the second group, 50 patients, an initial dose of 6 gr. was given followed by one-sixth grain of morphine when the pains became more severe. The third group, cesarean section cases, will be discussed later in this report.

In this experiment careful note was made of the rapidity of action of the sodium amytal, its efficacy in the relief of labor pains, the value of the drug in long and short labors and the possibility of idiosynerasy. Complete amnesia within one hour after administration was taken as the criterion of efficiency of the drug. During labor all external stimuli were reduced to a minimum and the necessary examinations were conducted with the greatest gentility. An additional dose of amytal or one-sixth grain of morphine was given when the maximal effect of the first dose had been obtained, and when the patient began to complain of the increasing severity of the pains.

A fair result was obtained in those patients who received an additional dose of 9 gr. of sodium amytal. The amnesia was moderately satisfactory and the patients complained of the severity of the pains about two hours after the initial dose. In the group receiving an initial dose of 15 gr., the results were very good. The sedative action of the drug was noted in about twenty-five minutes, at which time the patient slept between pains. The

patient, during uterine contractions, became restless, crying out; then as the acme of the pain receded, she was somnolent.

This condition occurred about one hour after the drug was given. When restlessness between pains and complaint was noted, an additional dose of the drug was given. During labor, the general physical condition of the patients was excellent. They could be aroused by adequate external stimuli, but they did not cooperate or answer questions satisfactorily. The skin was pink, moist, and warm. The temperature and pulse exhibited no perceptible change. In only two cases was there a fall in blood pressure of 15 mm. Gastrointestinal disturbance was not noted.

The results were excellent in the group of patients who received 6 gr. of amytal and one-sixth grain of morphine. Amnesia and analgesia were more prolonged, the pains when severe did not arouse the patient and co-operation in directions was about the same as in the above group. There was no change in the general physical condition.

Labor has not been prolonged by the use of sodium amytal or its combination with morphine. In primiparas the average duration has been; first stage fourteen hours, second stage fifty-five minutes. Multiparas, first stage four hours, second stage twenty minutes. The efficiency of the pains has not been reduced; however since excitement and restlessness was a common occurrence, watchful nursing was necessary.

In the group of patients receiving amytal only, cooperation in the act of "bearing down" was unsatisfactory. However, involuntary muscular action was good and the second stage of labor has not been prolonged. A large number of these patients were confined in the Obstetrical Service of the Municipal Hospital where the internes are taught such operations as episiotomy and outlet forceps. Hence, these procedures might explain the rapidity of the second stage of labor.

About 10 per cent of the patients have become quite restless at the time of delivery, moving about and disarranging the sterile field. Contrawise, the group which received amytal and morphine only rarely became restless at that time. This was probably due to the action of the morphine. Restlessness has been controlled by the use of a mild mixture of nitrous oxide and oxygen (N_2O 20 per cent, O_2 80 per cent) and it has not decreased the efficiency of the uterine contractions. The same gas mixture has been used for perineal repairs and forceps operations. The anesthesia has been very smooth and there has been no cyanosis or postanesthetic discomfort.

In this series of 200 cases, there were 60 operative deliveries, viz.: outlet forceps 53, mid-forceps 4, version-extraction 1, forceps on after coming head 1, breech extraction 1. The outlet forceps were done for interne instruction; 2 mid-forceps were indicated for rapidly falling fetal heart tones and the remainder were associated with prolapsed cord. The indication for version extraction was prolapsed cord occurring in the third triplet in face presentation. Episiotomy was a routine procedure in nearly all primiparas.

As soon as delivery was completed the babies cried vigorously and there was no evidence of cyanosis. Three of the babies delivered by mid-forceps required mild resuscitation. Two deaths have occurred in this series; one child died at the end of two weeks from a syphilitic infection; the other, a Mongolian idiot, died from pneumonia. The remainder were in good condition on the final inspection at the end of two weeks.

No complications have occurred in the postpartal period. The uterus contracted firmly after expulsion of the placenta and postpartum hemorrhage did not occur. Temperature, respiration, pulse, blood pressure, and tympanites have shown the normal physiologic variation. Bladder and bowel control has been excellent. Toxic rash and itching did not occur. After delivery, the patients slept soundly for about six hours, and they usually had only a slight recollection of the labor. Many of them stated that they remembered nothing after taking the second capsule. During the postpartum sleep, the patients had the usual nursing supervision.

Laparotrachelotomy was performed on the third group of patients. The indications for this operation were old primiparity with rigid pelvic tissues, placenta previa, primiparity with toxemia, contracted pelves, and one case of pregnancy occurring in a ventrally suspended uterus. This procedure was done on 9 patients before the advent of labor, while the remainder had an eight hour test of labor.

To those patients not in labor, 6 gr. of sodium amytal was administered orally at 10 P.M. on the evening before the day of operation. At 7 A.M. on the following morning 6 gr. additional were given, followed by one-quarter grain of morphine by hypodermic forty-five minutes before the operation, which occurred at 9 A.M. Eight ounces of a 1 per cent novocaine solution was used as a local infiltration anesthetic. The patient was mildly somnolent and did not complain when the baby was removed from the uterus. When the operation was finished, the subject was completely asleep. The procedure consumed about one to one and one-quarter hours' time. The postoperative sleep was about twelve hours' duration, and upon awakening the patient remembered nothing of the details. Resuscitation was not used on any of these babies and during their two weeks in the hospital they reacted normally.

Six patients were subjected to an eight hour test of labor before laparotrachelotomy. During this time each patient was given 12 gr. of amytal and forty-five minutes before operation a hypodermic injection of one-fourth grain of morphine. Novocaine, 1 per cent, was used as a local anesthetic. After the last dose of amytal the patient complained slightly of the pains and during the operative state she was moderately sleepy. By the time that the abdominal wall was closed, the patient was completely somnolent. The babies were in good condition and resuscitation was not used.

The effects of the drug have been expressed, viz.: excellent, when the patient was somnolent between pains and analgesia was complete; good,

when there was moderate analgesia; fair, when slight amnesia and remembrance of the pains was retained and poor when slight drowsiness was noted.

A total dose of 15 gr. of sodium amytal was given in the first group of patients. A good result was obtained in 32 and a fair result in the remainder. The second group received a total dose of 21 gr. of sodium amytal. Good results occurred in 27, moderate effect in 2, and an excellent outcome in 36 patients. The third group received a total of 6 gr. of sodium amytal and one-sixth grain of morphine. An excellent effect was obtained in 42 patients and a good result in 8. The preponderance of good results in this group was probably due to the synergistic action of the morphine.

To the patients on whom an elective laparotrachelotomy was performed a total dose of 12 gr. of sodium amytal combined with one-fourth grain of morphine was given. Excellent results occurred in the entire number. The remainder of this group were subjected to a laparotrachelotomy during labor. Within the eight hour test of labor they received 12 gr. of sodium amytal and one-fourth grain of morphine. The results were excellent in 4 and good in 2 patients.

SUMMARY

1. The oral administration of sodium amytal in labor has been satisfactory in the majority of cases in this study.

2. The oral dosage can be more definitely controlled than the intravenous method.

3. Labor has not been prolonged and no deleterious effects have been noted on the babies.

4. In this study no idiosyncrasy to the drug has occurred.

5. The degree of analgesia depends on the amount and time of administration of the drug.

6. Sodium amytal is not a complete analgesic, hence it cannot be depended upon in all cases. The best results have been obtained with an initial dose of 15 gr., which may be increased to 20 gr. during the course of labor. The combination of amytal and morphine gave excellent results which were probably due to the synergistic action of the latter.

7. During labor, careful nursing supervision is necessary since some of the patients become quite restless.

8. Sodium amytal has a definite value as an adjuvant analgesic combined with morphine and a local anesthetic in laparotrachelotomy before or during labor.

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909 PROFESSIONAL BUILDING.

TUBERCULOSIS OF THE FEMALE GENITAL TRACT

HUBERT S. BUSH, M.D., NEW YORK, N. Y.

(From the Gynecological Service of the Roosevelt Hospital)

A STUDY of the cases of tuberculosis of the female genital tract treated on the Gynecological Service of the Roosevelt Hospital for the years 1911 to 1930 has been made with the special purpose of determining the relative success or failure of conservative or radical operations for this disease.   Certain features of the pathology and etiology of this disease of importance in the determination of methods of therapy have also been reviewed.

Incidence.—At the Roosevelt Hospital, during the twenty year period, 1987 pathologic tubes were removed, 51 of which were found to be tuberculous, an incidence of 2.6 per cent.   In two of these cases there was an accompanying tuberculous appendicitis and in a third, a tuberculosis of the sigmoid, but we believe that the disease was primary in the tubes.

Age.—In the Roosevelt Series of 52 cases of tuberculosis of the female genital tract, there were 3 between fifteen and twenty years of age.   Forty-six, or 88 per cent, were of an age falling in the childbearing period.   There were two over forty years of age, the oldest being fifty-three.

Fertility.—In the Roosevelt series, there were 36 women married two years or more.   Of this number, 14 have been pregnant one or more times, while 22 have never been pregnant, an incidence of 61 per cent of sterility.

Pathology.—A knowledge of the relative frequency of the involvement of various parts of the genital tract is essential to the surgeon, if he is to judge intelligently the necessary extent of his operation and the dangers of conservatism.

Most authorities state, that the order of frequency of organs involved is as follows: tubes, uterus, ovaries, cervix, vagina and vulva.   Our order of frequency is the same, except that the ovaries were more frequently involved than the uterus.

In the Roosevelt series, oophorectomies were done on 48 patients in which tuberculous ovaries were found in 19, or 39 per cent of the cases.

Tuberculosis of the uterus is not as infrequent as formerly thought to be.   Since this is a descending infection, the endometrium is more frequently involved than the myometrium.   In the Roosevelt series, out of 52

cases of genital tuberculosis, 31 had an examination of the uterus and 15 of these were found to have a tuberculous involvement of the uterus, an incidence of 28 per cent. This incidence is too low, as the uterus was not examined in 21 cases and undoubtedly several cases of uterine involvement were missed. The incidence among those uteri examined was 48 per cent. Greenberg reports an incidence of 45 per cent among his 200 cases of genital tuberculosis and an incidence of 72.6 per cent among his hysterectomies. Smith found a low incidence of 22 per cent among all his cases of genital tuberculosis.

It is important to do a curettage routinely, so that if a hysterectomy is not done, one will have evidence as to whether the uterus is involved. The myometrium is rarely involved without a tuberculosis of the endometrium.

In our series of 15 cases with uterine involvement the endometrium was involved in every case except one and in this case, the myometrium was involved alone.

One can quite positively say, that where the endometrium is shown to be tuberculous, that the tubes will be found tuberculous. In our series 14 out of 15 cases with uterine involvement had a tuberculous salpingitis and one case was doubtful.

The diagnosis of tuberculosis of the cervix is often difficult, because of marked secondary infection. Bishop believes that tuberculosis of the cervix is usually a descending infection secondary to endometrial involvement. In the Roosevelt series of 52 cases, the cervix was involved in one case, an incidence of 2 per cent. This case also had a tuberculosis of the tubes and endometrium. It is also of interest, that in another case in which there was a tuberculosis of the tubes and endometrium, there was also an epidermoid carcinoma of the cervix. There were no cases of tuberculosis of the vagina or vulva in the Roosevelt series.

An important reason to consider the relative frequency of tuberculous foci in the pelvic organs, particularly the tubes, is the danger of a resulting general tuberculous peritonitis. The late Sir William Osler stated, that in at least 30 to 40 per cent of instances of laparotomy for this affection, the infection was from the tubes. Norris states that tuberculosis of the tubes is usually the primary intraperitoneal focus. Greenberg, among his series of 200 cases, found 126 with peritoneal involvement, an incidence of 63 per cent. Taylor states, however, that there is ample clinical evidence that an active tuberculous salpingitis does not always infect the peritoneum, as evidenced by the frequency with which healed tuberculous lesions are found in the tubes with apparently normal peritoneum.

Operation.—All of our series of 52 cases eventually came to operation. There were two deaths, a primary operative mortality of 3.8 per cent.

We have classified the operations into three main types: first the radical, in which a hysterectomy with removal of both adnexa was done; second, conservative, with preservation of menstruation, in which both tubes were removed and one or both ovaries and uterus were preserved; and third,

conservative operation, with an attempt to preserve the reproductive function, in which a patent, grossly normal tube, or a portion of diseased tube with a salpingoplasty, are preserved, together with the ovaries and uterus.

RADICAL OPERATION

The radical operation is applicable in those women near the menopause and in younger women, where the extent of the disease makes a complete removal imperative. There were 21 patients who had this radical operation. Twelve of these were followed for varying periods of time. Six out of twelve were having symptoms the last time they were seen and 6 were symptom free. Three of the 6 were having negligible symptoms and were in good health; one had symptoms not referable to the previous tuberculosis; another complained of urinary frequency and burning micturition with backache; while a third case had marked symptoms of an active pulmonary and general peritoneal tuberculosis. So that of the 12 cases, we may say, that 9 were either cured or showed marked improvement; 2 were somewhat improved; and one was in a worse state of health.

CONSERVATIVE OPERATION TO PRESERVE MENSTRUATION

This type of operation is indicated in young women with grossly normal ovaries and a normal uterus. Most authorities agree that both tubes should be removed whether one is grossly normal or not, as the disease is usually bilateral on microscopic section. Taylor found it difficult to decide regarding the removal of the uterus in young women with normal ovaries. In a number of his own cases of tuberculous endometritis, he did not remove the uterus and in no known cases was there any subsequent trouble.

Ten out of 14 of the tuberculous endometritis cases in our series were followed in the recall clinic. In 7 patients the uterus was not removed and only 2 of the 7 have had to have a subsequent hysterectomy because of menorrhagia due to a tuberculous endometritis. While a tuberculous uterus cannot be preserved with impunity, the danger of leaving it is not great.

Ten patients in our series had this conservative type of operation, and we were able to follow 9. Of the 9 followed, 7 were symptom free or in good health and having negligible pain on the side of the remaining ovary, and 2 were not improved. Of the 2, one was in fair health, but returned four years later for removal of the uterus and ovary because of a severe menorrhagia due to a tuberculous endometritis. The other patient was suffering from a very advanced recurrent carcinoma of the cervix.

CONSERVATIVE OPERATION WITH AN ATTEMPT TO PRESERVE THE REPRODUCTIVE FUNCTION

The indications for this operation are few. It might be desirable to perform this type of operation in the case of a very young woman with very limited disease because of certain sociologic factors. There is no particular

point in otherwise preserving a tube or portion of a tube, because it is very rarely that these women become pregnant after such an operation. If it were possible to relieve the sterility, pregnancy is not desirable in many of these women, as they have either an active, or a latent pulmonary tuberculous lesion which might become active and have a fatal outcome, if pregnancy were to ensue. Also, as we shall point out in our end-results, in cases where a tube has been preserved, there is apt to be an increased amount of pathology in the remaining tube with a necessary subsequent operation.

This conservative type of operation was performed on 22 patients and we were able to follow 14 of these. Out of 14, 9 were cured or markedly improved and 5 were not improved or in a poor state of health. Two of these latter patients returned to the hospital, one five years, and the second fifteen years after the first operation, for the removal of the uterus and remaining adnexa. One of these was having adnexal pain and losing weight and the second was having severe menorrhagia and metrorrhagia, due to a tuberculous endometritis. Two other patients were in good health, but had persistent abdominal fecal fistulas. A fifth patient was having lower abdominal pain, dysmenorrhea, and irregular menstruation.

Of the 15 patients in our series with a general tuberculous peritonitis, 8 were followed. Two were cured and showed a gain in weight, 5 were improved and had no symptoms referable to the tuberculous peritonitis, and one was definitely worse, with active pulmonary and general peritoneal tuberculosis.

Complications.—Because of the dense adhesions found in this disease, the bowel and bladder are frequently injured. There was injury to the bowel in 5 or 10 per cent of the cases and the bladder was injured in one case. Nineteen or 37 per cent of the cases were drained. Four were drained abdominally, 11 vaginally, and 4 had combined drainage through the abdomen and vagina. Of the 8 patients with abdominal drains, 3 developed abdominal fecal fistulas, an incidence of 37 per cent and of the 15 cases with vaginal drains, only one of the cases developed a vaginal fecal fistula. One case drained only through the vagina developed an abdominal fecal fistula. Out of 19 cases drained, 4 or 21 per cent developed fecal fistulas. Two of the fistulas occurred in cases where an opening had accidentally been made in the bowel and an enterorrhaphy had to be done. Of the 4 fecal fistulas only one was healed at the time of leaving the hospital.

Injury to the bowel and drainage are productive of fecal fistula. Where an enterorrhaphy has been performed, drainage must be done. In the cases where no injury has been inflicted on the bowel, drainage is not carried out as frequently as formerly and if it is deemed necessary, vaginal drainage only should be done, as it is believed that there will be fewer abdominal tuberculous sinuses and if a fecal fistula results, a vaginal fistula is preferable to an abdominal.

Wound suppuration occurred in 16 or 31 per cent of our cases and was more frequent in the febrile than afebrile patients. Fourteen of the 16

patients with resulting sinuses were not healed completely at the time of leaving the hospital.

CONCLUSIONS

Tuberculous salpingitis must be kept in mind when operating upon any chronic salpingitis patient. When the diagnosis can be made from the gross specimen at the operating table, a choice must be made between a radical operation and a conservative operation to preserve menstruation. A conservative operation to preserve reproduction is almost never indicated.

All febrile cases should have a course of expectant treatment to lessen the danger of wound suppuration and the development of tuberculous sinuses in the abdominal wall. Drainage should not be done on every purulent case, but only if one believes there is a good deal of secondary infection with damaged tissue. Drainage by vaginal route is preferable to abdominal drainage.

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ENDOMETRIOSES OF LYMPH NODES

G. H. HANSMANN, M.D., AND J. R. SCHENKEN, M.D., IOWA CITY, IOWA

(From the Department of Pathology and Bacteriology, College of Medicine, State University of Iowa)

EVEN though occasional scattered reports on heterotopic endometrial tissue were present in the literature, it remained for the continued enthusiasm and the inexhaustible energy of Sampson to call with adequate force to the attention of the medical profession the natural history and the importance of endometriosis. Numerous contributions to the subject have since appeared. The studies concern the clinical nature of the disease, the morbid anatomy, the function of the heterotopic endometrium, studies of the mechanism of production of the lesions, and the effect of menopause or ovariectomy on the course of the disease. Evidence has accumulated to show that there are a number of explanations for the occurrence of heterotopic endometrium, and that no single explanation seems adequate to account for the morbid anatomy found. The two prominent theories of inflammation of peritoneal endothelium which is followed by metamorphosis of the mesothelial cells into endometrial-like tissue and the implantation on the peritoneum of viable

endometrial cells contained in menstrual blood which has gained access
to the peritoneum through the oviducts have been fully discussed in the
literature. The possibility of origin of endometrial-like tissue from
rests of the urogenital apparatus, especially the müllerian ducts and the
mesonephros, have received considerable mention. The actual entrance
of endometrial cells into the venous sinuses of the uterus seems certain
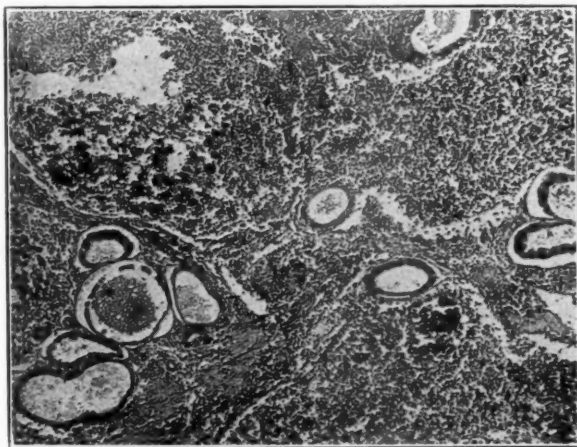
Fig. 1.—Case 2.—Photomicrograph showing endometrial glands in the cortical portion
of a lymph node. ×55.

Fig. 2.—Case 1. Photomicrograph of peripheral sinus and cortical portion of lymph
node. Note the endometrial glands in the peripheral sinus and germinal centers of the
node. ×55.

from the work of Sampson. Little has been demonstrated on the
metastasis of normal endometrial tissue by the lymphatic route. We
found a single reference where the pathology was so interpreted.

Two postmortem examinations recently made at Iowa State University
required a study of regional lymph nodes of the uterus. In both
examinations, very definite endometrial tissue was found in the absence

of neoplasm of the endometrial epithelium of the uteri. Heterotopic endometrial tissue was, however, found in each ovary of one of our cases.

CASE 1.—*History.*—E. H. (F-9587), a white American female aged twenty-nine, entered the University Hospital on November 19, 1931, because of persistent uterine hemorrhage. This hemorrhage had been present intermittently with no relationship
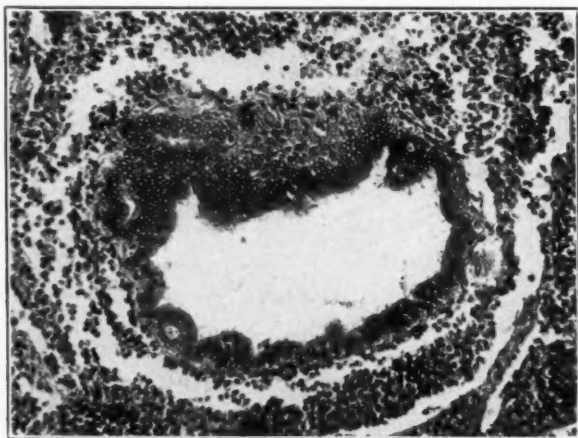
Fig. 3.—Case 1. Photomicrograph showing acinus formation and accurate histology of endometrial histology. ×155.
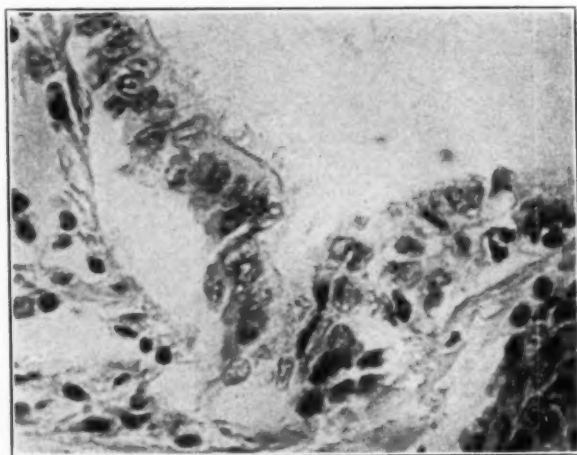
Fig. 4. Case 1. Photomicrograph showing cytology of stroma cells and of endometrial cells with cilia. ×525.

to her regular periods since November, 1930. In July, 1931, metrorrhagia became continuous. Curettage was done elsewhere in September, 1931, but no report of findings was available. On November 28, 1931, a curettage was done at the University Hospital and only a somewhat thickened endometrium was found. Hemorrhage continued. A few weeks later she returned to the hospital and a hemorrhagic looking mass was found protruding from the cervix. The histopathologic finding of this tissue was that of a chorionepithelioma. A hysterectomy was promptly done.

Transfusions were given because of anemia. During one of the transfusions she complained of pain in the abdomen and hip. Even though the transfusion was discontinued, the patient died.

Pathologic Findings.—The uterus was not much enlarged but the cavity was distended by a hemorrhagic chorionepitheliomatous mass which extended from within 1 cm. of the fundus of the uterus to a small mass protruding from the cervical os. The mass was adherent to the posterior wall and the remainder of the uterine wall was covered by endometrium.

The postmortem examination revealed an old operative scar. The appendix, right tube, and ovary had been removed. There was a recent operative scar. The left ovary was present and the left tube was sutured to the vaginal vault. The retroperitoneal lymph nodes were enlarged. Deep in the parenchyma of the right lower lobe of the lung was a hemorrhagic nodule 1 by 0.7 by 0.8 cm. Springing from the outer surface of the left lung was a mass 2 by 3 by 3 mm.

The histologic study revealed that the uterine neoplasm was a chorionepithelioma. The nodule in the parenchyma of the right lung was a chorionepithelioma. The nodule in the left pleura was made up of adult cartilage. Scattered in the peripheral sinuses and in germinal centers of the enlarged retroperitoneal lymph nodes were endometrial glands that were typical in every respect. They formed an integral part of the node. The cells lining the acini had a very definite cuticular border and well formed cilia were found where the cutting knife had paralleled the long axis of the acinar cells.

CASE 2.—*History.*—A. G., a colored female aged thirty-one, died shortly after several gunshot wounds of the chest, one of the bullets having pierced the heart. No other history was available.

Postmortem Examination.—In addition to the gunshot wounds, there were adhesions of both pleurae and caseation necrosis of the bronchial, mediastinal, and retroperitoneal lymph nodes. The pelvic organs were matted together by old fibrous adhesions. The endometrium was of normal thickness. The uterus was not enlarged. The kidneys were scarred, and the aorta was puckered by an old syphilitic aortitis.

Histologic examinations proved the above observations correct. In addition, there was endometriosis of both ovaries and of the pelvic retroperitoneal lymph nodes.

The ages of the patients were twenty-nine and thirty-one. One had recently had a hysterectomy for a chorionepithelioma. This neoplasm, no doubt, opened the circulation and permitted endometrium to enter and float off in the lymphatics to the regional lymph nodes. The other had the internal genitalia distorted by an inflammatory disease of the pelvic organs, and there was endometriosis of the ovaries. The circumstances conducive to endometriosis, as pointed out by Sampson, are fulfilled in our cases.

Halban is of the opinion that the implantation theory of Sampson and the irritation theory of Iwanoff-Meyer do not explain the endometrial tissue when found deep beneath the pelvic peritoneum, in the inguinal region, in the perineum, and in the round ligament, all of which are covered by normal peritoneum. He has, for this reason, proposed the theory of lymphatic spread of endometrial tissue as a general explanation for endometriosis wherever found. This theory apparently influenced Mestitz in his comprehensive review of endometriosis which

included two cases with metastases of endometrial tissue to lymph nodes. His review informs us that endometrial-like epithelium has occasionally been found in lymph nodes since 1897 when Ries first noted it. After suggesting that the carcinoma for which the uterus was removed had opened the circulation and permitted the entrance of endometrium, Ries came to the conclusion that the pathologic finding arose from a rest of the mesonephros. A neoplasm of the uterus has been present in most instances where epithelium has been found in the regional lymph nodes, and the possibility of a metastatic neoplasm has probably been given undue consideration as an explanation when aberrant tissue even as typical as endometrium is found in the regional lymph nodes. The irritation theory of Iwanoff-Meyer has also had its adherents in the explanation of this condition when found in lymph nodes. Mestitz was of the opinion that in his cases the endometrium in lymph nodes was a metastatic phenomenon concerning normal endometrium of the uterus, a conclusion which, in view of our knowledge, seems the most logical.

An interpretation of the pathologic changes found, when coupled with the physiology of the lymph node, warrants the conclusion that the endometrial cells are metastatic to the lymph nodes and that growth has occurred in this aberrant location. The distribution of the endometrial tissue in the peripheral sinus and in the germinal centers of the lymph nodes, findings we are wont to observe in the metastasis of any neoplasm to lymph nodes, is in accordance with the circulation of lymph through the node. The question of metamorphosis of endothelium of lymph nodes to endometrial-like tissue does not seem likely since no transition from endothelium to endometrial tissue was observed and excessive activity on the part of the endothelium in the vicinity of the endometrial tissue was absent. Under the conditions found, the metamorphosis of endothelial cells into endometrial-like tissue would involve the mutation of the endothelial cell into endometrial and stroma cells. Such an interpretation seems fanciful when we recall that the vessels of the endometrium are open during menstruation and that viable endometrial tissue has been found free in the oviducts as well as in the venous sinuses and the lymphatic vessels of the uterus. Further, endometrial tissue has grown when seeded into the peritoneal cavities of rabbits and monkeys. Growth of the endometrial tissue in the lymph node is evidenced by the fact that the tissue has become an integral part of the node.

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THE USE OF MORTALITY STATISTICS IN RATING
MATERNITY SERVICE

James Raglan Miller, M.D., F.A.C.S., Hartford, Conn.

IT IS inevitable that the mortality record of a maternity service be used to some extent as a measure of the quality of that service in a given hospital. Certain fundamental fallacies in the use of statistics have presented themselves so often that a brief comment is timely. We read, for example,[1] that the Chicago Lying-In Hospital delivered 23,136 women with 57 deaths, giving an institutional mortality of 0.247 per cent. Munro Kerr and MacLennan[2] on the other hand report five years' experience at the Royal Maternity in Glasgow; 19,806 women were delivered and 536 deaths reported, a gross mortality of 2.7 per cent.

Is it correct to assume that a woman runs over ten times the risk in having a baby in the Royal Maternity Hospital that she would in the Chicago Lying-In Hospital? The contrast is so great that one is led to ask if there be no difference in the kind of service offered to the community, or in the type of patients handled, etc. We note, e. g., that 11.1 per cent of the deaths in Glasgow occurred in patients who were admitted in a moribund condition, more than died at the Lying-In Hospital in the entire series. We know that poverty and rickets are responsible for many more disasters in Glasgow than in Chicago; furthermore, the Royal Maternity serves Glasgow to a large extent as an emergency institution, for the people do not go to hospitals so often for uncomplicated deliveries, and the good rates at the Lying-In may be caused by the large number of normal uncomplicated cases, quite as much as by the unquestioned excellence of obstetric care.

An excellent example of what I mean is given in the report of the Maternity Service of the Boston City Hospital, by F. E. Good.[3] The mortality rate was reduced from 3.2 per cent in 1922 to 0.55 in 1929. Laymen and physicians may well be proud of such a record. We must remember, however, that ratios are merely fractions expressed in the decimal system where the denominator of the fraction is less prominently shown. In the Boston City Hospital the number of deliveries in the period studied increased from 652 to 1550. Not only were the actual deaths reduced from 21 to 8 but the improvement in the mortality rate is also due to the increased accommodations afforded labor cases whereby normal labors are now conducted in the hospital which formerly occurred at home. Normal deliveries increased from 485 to 1015 in these years.

There is scarcely a hospital doing maternity work anywhere in this country that is not affected in this way, so that we must know the "hospitalization habits" of a community and the type of obstetric service offered by a hospital before we can say that a given mortality rate is good or bad. The effect of the increase of prenatal care in a community cannot be

shown unless statistics are compiled on a city-wide basis, showing the changes in hospitalization habits.

Likewise, nationality plays an important rôle. Hospitals which cater to Hebrews, Italians, and Swedes should have much lower rates than those whose wards are filled by Negroes, Scots, Irish, or Poles.

The difficulties of gathering moderately dependable figures for a hospital showing the three important factors, (1) maternal deaths, (2) neonatal deaths, (3) stillbirths, cannot be appreciated by one who has not tried to do this in a busy general hospital. Unless history charts are reviewed carefully according to definite standards of classification and with attention to "lost" cases which are transferred to other services, most general hospital statistics will be unreliable.

Physicians rightly object to including abortions and chronic nephritis, ectopic pregnancy, etc., in the list of causes of death which are quoted to show the quality of obstetric care. Deaths from heart disease, tuberculosis, acute infectious disorders, and many other conditions are not called puerperal even at full term, according to definite rules laid down by the Census Bureau in its "Manual of Joint Causes of Death." Chronic nephritis, however, is always classed as a puerperal cause, because it is so often impossible for the fairest minded and most skilled physician to differentiate it from toxemia of pregnancy. I believe that all these "non-puerperal" deaths should be shown in our reports just as much as the truly puerperal causes, whether or not they be included in a mortality ratio, for it is quite evident that skill in obstetrics is shown at its best in the management of these complicated cases.

We can also see the effects of the high or low level of medical education and prenatal supervision in viewing these conditions. A community which allows its mothers with advanced heart disease, tuberculosis, etc., to go to term will show a higher rate than one where birth control and sterilization of such cases is practiced. Statistics are meant to show the truth, and not to be set up as material for arguments or propaganda; let them be more complete and arranged so that the truth can be seen, "*Veritas vos liberabit.*"

I wish to present in this paper some figures covering fifteen years of maternity service at the Hartford Hospital, 1916 to 1931 (fiscal year beginning October 1), giving those facts which I believe are necessary to know before one can judge the value of the mortality record.

The Hartford Hospital Maternity Service is open to any physician of good reputation who is on the courtesy list. The deliveries totaled 17,697 mothers, including 201 twins, and 1 triplet. There were 36.6 per cent of the cases delivered on the ward service. The proportion of deliveries in our hospital to total live and stillbirths in Hartford increased from 18.65 per cent in 1916 to 41.55 per cent in 1931 (calendar year). The percentage of primipara now runs about 40 per cent as contrasted to about 33 per cent for the city at large. Prenatal care is fairly well understood

throughout the city, and we believe that at least five prenatal visits are
made in over 50 per cent of the cases. Nationality groups appear to be
unimportant as an influence on our statistics in Hartford in this field.

1931. HARTFORD POPULATION, 167,680; BIRTH RATE, 16.25 PER 1000.

	TOTAL	RESIDENTS	NON-RESIDENTS
Live and stillbirths	4029	2689	1340
Live births	3938	2629	1309
Stillbirths	91	60	31
Maternal deaths	15	10	5
Rate per 1000 live births	3.8	3.8	3.8
Institutional deliveries	3515	2183	1332
Percentage of total	87.3%	81.5%	97.5%
Delivered in Hartford Hospital	1672	910	762
Percentage of total	41.5%	33.8%	56.8%
Delivered in St. Francis Hospital	1369	902	467
Percentage of total	34%	33.5%	34.8%

Here we encounter the old difficulty of the "maternal mortality rate"
which is prepared by our Board of Health very carefully, in strict ac-
cordance with rules laid down by the Census Bureau. These figures in no
way compare to those of the hospitals, as shown above, since the hospital
figures are reckoned on all the cases which come for delivery. If we wish
to present our hospital figures at all, we should include all deaths which oc-
curred in the hospital where pregnancy was known to have occurred. The
advantages of the following presentation will be apparent if it be used to
compare our hospital with any other, or to watch our own progress.

DELIVERIES

	1916-1921	1921-1926	1926-1931
Ward	1828	1636	2950
Private	2967	3590	4670
Total	4845	5226	7624

168* deaths occurred complicated by pregnancy or puerperium.

39 of these (including 9 ectopics) had advanced less than sixteen weeks.

16 (including 1 ectopic) were between sixteen and twenty-eight weeks.

113 had advanced to at least twenty-eight weeks' gestation.

27 of these were delivered before admission.

86 came to the hospital at least twenty-eight weeks pregnant.

8 of these died undelivered.

The influence of the increased hospitalization on "better obstetrics" is
shown as follows:

	1916-1921	1921-1926	1926-1931	Total
Deaths after delivery before admission	20	4	3	27
Deaths, unsuccessful attempts before admission	5	0	0	5

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*These deaths were checked for completeness (1) on our labor record book,
(2) on the undertaker's book (3) in the hospital record department, and (4) by the
Board of Health files.

Analysis of individual groups might be given to advantage, as follows:

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8 died undelivered:
1917   Private   Pulmonary Tuberculosis
1918   Ward      Influenza
1919   Ward      Cardiac
1920   Ward      Toxemia, chronic nephritis
1924   Ward      Dystocia, catastrophe by interne
1927   Private   Acidosis, late toxic vomiting
1927   Private   Ileus, former operation
1928   Ward      Cardiac
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If we analyze the 86 "viable" pregnancy deaths in five year periods, we get some remarkable figures, as follows:

	1916-1921	1921-1926	1926-1931	Total
Ward	22	6	13	41
Private	22	10	13	45
Total	44	16	26	86
Mortality Rates:				
Ward	1.16%	0.36%	0.44%	0.63%
Private	0.74	0.28	0.28	0.40
Total	0.91	0.31	0.34	0.49

It will be noted that one-half of the deaths occurred during the war-time "Flu" period.   Of special interest is the mortality rate of 0.28 per cent over a period of ten years on the private service covering 8260 mothers, albeit, in a general hospital where the courtesy staff is large and the incidence of interference with normal labor both by cesarean section and low forceps is very high.   No wonder that our practicing accoucheurs belittle the ultraconservative preachments of the Medical Schools.   My own ward service responsibilities, over twelve and a half years, since returning from military service, have covered over 2500 ward deliveries with a gross mortality rate of 0.28 per cent.

The causes of death of the 86 cases may be grouped as follows:

	HARTFORD HOSPITAL		CHICAGO LYING-IN HOSPITAL	GLASGOW ROYAL MATERNITY
Toxemia	33	38.4%	17.5%	30.0%
Sepsis	12	14.0	12.3	21.2
Dystocia (Shock etc. incl. cesarean)	9	10.5	6.1	12.4
Hemorrhage (Pl. previa)	6	7.0	12.3	10.1
Embolism	5	5.8	8.8	2.3
Nonpuerperal	21	24.4	40.4	13.7

This is quite a different picture from that which health agencies and national statisticians show us.   This, I take it, represents much more truly a survey of the material with which we, as obstetricians, are primarily concerned in conducting a maternity hospital service.

The figures given for the Royal Maternity include 26 abortions and 33

miscarriages, but 60 cases, moribund on admission, were not included. These figures are placed side by side to emphasize that such comparison must not be taken too seriously on superficial examination.

When, however, the low mortality rate for the Hartford Hospital is backed up by the low maternal mortality rates of the city, viz., 4.3 and 3.8 per 1000 live births in 1930 and 1931, we may say that our service is doing good work. How much better it might be can be guessed by counting the avoidable disasters and weighing them against the probabilities that similar cases will be handled better in the future.

A brief explanation of the 21 deaths due to nonpuerperal causes may be given as follows:

Heart disease	5	Syphilis	1
Pneumonia	5	Ileus (former operation)	1
Influenza	3	Tetanus (catgut)	1
Tuberculosis	2	Acute appendicitis	1
Diabetes	1	Septicemia (cut finger)	1

Deaths following cesarean section should be listed as follows, with indications for operations.

1917 2 Eclampsia, 2 dystocia	1925 1 Toxemia and diabetes, 1 peritonitis (indication?)
1918 1 Eclampsia, 1 dystocia	1926 1 Eclampsia
1919 1 Eclampsia	1927 1 Cardiac, 1 elective, second cesarean (ileus)
1920 1 Tetanus, 1 fibroid uterus (ileus)	1929 1 Septicemia (finger)*, 1 toxemia
1922 1 Eclampsia	1930 1 Eclampsia (spinal), 1 toxemia (spinal)
1923 1 Eclampsia, 1 cardiac, 1 placenta previa and nephritis	

Conservative obstetricians will point to the large number of deaths (8) where cesarean section is done for eclampsia. These with three toxic cases comprising just 50 per cent of the mortality after the cesarean operation. I think most Hartford physicians have learned this lesson.

Unusual and somewhat perplexing figures are given below for the convulsive cases. We have, for want of a more accurate grouping, called all cases eclampsia where convulsions were noted. More careful differentiation is for the future and cannot be made, at least, with the data available.

	1916-1921	1921-1926	1926-1931	TOTAL
Cases	52	33	27	112
Deaths	13	2	8	23

Figures for morbidity should be given, but unfortunately they are not available except for the past six years, and as yet there is no commonly accepted standard to go by.

Complete figures are not at hand for stillbirths and for neonatal deaths

*The real indication was an incorrect diagnosis. We knew that the baby was dead, but the finger cut with a bread knife, had entirely healed, and as the patient had a rigid abdomen (due to peritonitis), we performed a cesarean on the bare chance that we might be dealing with an apoplexy of the uterus.

over this same period, but they should be given according to some commonly accepted method.

I have elsewhere[4, 5] proposed that the period of viability, viz: twenty-eight weeks or more, be the period to be studied, as well for maternal deaths as for stillbirths and neonatal deaths, and that in counting neonatal deaths, we enumerate only those which have developed to the twenty-eighth week or more at time of birth, and which die during the first seven days after birth.* The reason for this restricted enumeration is that it is sensible, representing the period over which the results of good or bad obstetric care are most evident. Furthermore, in spite of the loss of a few cases before the period of viability and after the seventh day, what we lose in completeness we gain in accuracy of the individual certificates, without which all statistics are in the category mentioned by Mark Twain. Physicians pay very little attention to the vital statistic reports of the Census Bureau, but they are interested in mortality rates of their own hospitals.

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179 ALLYN STREET.

Mayer, A.: Lumbar Anesthesia, Arch. f. Gynäk. **144**: 414, 1931.

The author reports the results obtained in a series of 4200 lumbar anesthesias in the Tuebingen clinic. There was one death in this series which could be laid to the type of anesthesia used, a mortality of 0.023 per cent. Unfortunately this procedure cannot replace inhalation anesthesia in the poor risks, i. e., endocrine disturbances, severe acute anemia, etc. There is very little mental shock to spinal anesthesia. The anesthesia lasts sufficiently long for practically all gynecologic operations. This is more true now than formerly since fibroids are now removed in thirty minutes and most operations for carcinoma take less than forty-five minutes. The frequency of post-anesthetic headache is unfortunate. It cannot be avoided by either careful selection of the patient or improvement of the technic. Whenever this complication can be avoided, lumbar anesthesia will be the ideal one.

RALPH A. REIS.

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*During the fiscal year 1930-1931, the Hartford Hospital had 1702 deliveries with 4 maternal deaths, 31 stillbirths, and 40 neonatal deaths, calculated according to this method.

MENSTRUAL INTERVALS

Jessie L. King, Ph.D., Baltimore, Md.

(From the Department of Physiology and Hygiene, Goucher College)

A FEW years ago the detailed menstrual records of 17 women covering 523 intervals were published (King[1]). Sixteen of the subjects were college women and the majority were students or were engaged in professional work. The ages ranged from nineteen to thirty-five years, 6 were over thirty and 5 were under twenty-five. For one member of the older group the record of the first 24 periods after the onset of menstruation was included. In this series, the most frequent interval, twenty-seven days, occurred 97 times and the remaining 426 intervals ranged from eighteen to thirty-seven days.

It is still the general opinion that the normal woman in good health has a twenty-eight-day cycle and that there are only slight irregularities of occurrence. Since this report showed rather wide variations, it has been criticized on the ground that the average age was high and that college and professional women do not form a representative group.

The great interest at the present time in the physiology of the reproductive cycle, justifies the presentation of additional data, largely from a younger group, which includes some industrial workers. It supports rather strikingly the former conclusion.

I am indebted to the medical service of the Eastman Kodak Plant at Rochester, and of the Western Electric Plant of Baltimore for the records of women in industry. It is not easy to find, even among college students, a group which has sufficient interest to keep an accurate record for periods long enough to be of value. It is naturally even more difficult with industrial workers.

The report presented herewith is based on the records of 37 women and includes 354 menstrual intervals. The number of intervals for a subject varies from 4 to 27. The 21 industrial women include machine operators, shop clerks and one secretary. There is also one maid. Of the other 16 women, one was a laboratory assistant, one a medical student and the others college students. Fifteen members of the entire series were from seventeen to nineteen years of age, 22 were between twenty and thirty-five. The data are tabulated according to occupational groups and then are charted, first on the same basis and then according to age. Those under 20 are included in the first age chart and those from 20 to 35 in the second.

The average irregularity of the intervals between the periods, whichever way the material is arranged, is even more obvious than that shown in the former study. This may be due to insufficient data or it may be because the average age was lower and the regularity of the cycle not as well established, 37 per cent of the intervals occurred in women under

TABLE I. THE FREQUENCY OF OCCURRENCE OF DIFFERENT INTERVALS ACCORDING TO OCCUPATION

INDUSTRIAL WOMEN	AGE	16	18	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	38	40	41	42	43	45	47	49	55	57	
																															INTERVAL IN DAYS
Inspector of boards on conveyor	17		1	1		1				1	2	2	2				3	1											1		11
Shop clerk	18								1	1	3	1	1	5	1	1	1														10
Operator machine	18											1	1	1	1	1	1	1	1								1	1	1		10
Shop clerk	18	1								1		1	4	1							1										4
Light "sitting work"	18																														
Machine work with great vibration	19							1			1		1					1													5
Operator of foot machine	19									1		1		1	1	1	1														5
Clerk (married)	21								2	1	2	1	3	2		2															10
Housemaid	21								1	1	7	1	1	1	2	1	1	1	1	1											13
Filing	22									4			5	4	1																11
Secretary	22					1							1	1		1	1	1	1	1	1					1				1	11
Braider, machine operator	23						1				1		1	1																	10
Sitting at work	23									1	2		2	2	2																5
Charge of mail department	24							1	1	1	1	1	4	1	1	1		1													11
Machine operator	25											3																			5
Standing and walking all day	26							2			1		2																		5
Operator, foot machine	29							2		1	1		4	1		1															5
Walking all day	30							1	1	1	1		1	1																	5
Heavy hand work (widow)	31									1	3																				5
Sitting at work	32								3		1	1	1	1		1		1													5
Standing and walking	35																														5
Total		1	1	2		2	1	7	9	14	27	15	28	19	8	7	7	3	2	1	1					1	1	1	2	1	167

TABLE II. THE FREQUENCY OF OCCURRENCE OF DIFFERENT INTERVALS, ACCORDING TO AGE GROUPS

COLLEGE WOMEN AGE	INTERVAL IN DAYS 16	18	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	38	40	41	42	43	45	47	49	55	57	Total
17					1				1	3	3		2	1	1		1	1	1					2						10
18						2	1	2		1	2	5	4		4	2														16
19				1	1	2	1	2		2	2	1	2	1	1															11
19							4			1			1																	10
19					1		1	1	1		1	1			3	2	1	1	1		1	1								5
19								3	1	2	1	1	1		1	2					1									14
19				1	4	2	2	2	1		1	1		2		2	1	1												10
19									6	4	4	4	2																	4
20							6	1	3	1	1	1	1	1	2															11
20					2			5		6		2	1	1	1	2	1													17
22										1		1																		4
22						2	1	1	3	4	3		1	1		2			1											27
23				1		1			1	6	1	1	1	1		2	1	1												20
24									3	4		1	1																	7
24							1						1		1															14
24																														13
Total				3	9	9	16	16	19	24	21	17	17	7	13	8	3	3	3		2	1		2						**193**
Total for two groups	1	1	2	3	11	10	23	25	33	51	36	45	36	15	20	15	6	5	4	1	2		1	2	1	1	1	2	1	**354**

twenty. No conclusions can be drawn as to the difference between the college and industrial groups. In the earlier series 18.5 per cent of the occurrences were at the twenty-seven-day interval. In the present series the most frequent interval was again twenty-seven days and the per cent was
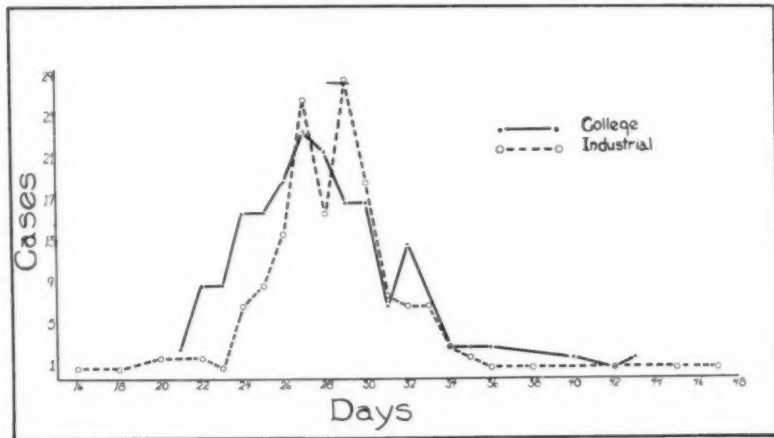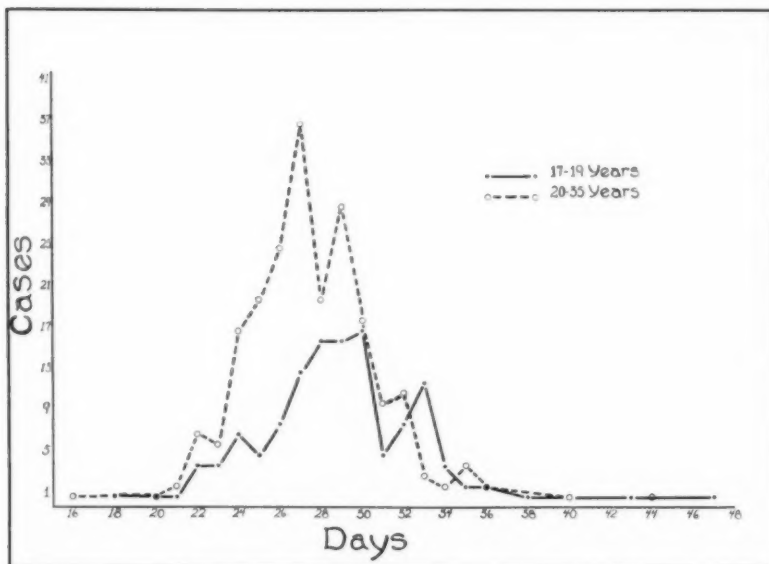

Fig. 1.

Fig. 2.

14.4. Intervals of twenty-eight, twenty-nine, and thirty days were close in number to the maximum interval. Fifty-six and seven-tenths per cent of the 354 occurrences are included in the twenty-sixth to the thirtieth days, while in the former series the twenty-fifth to the twenty-ninth days included the greatest number, 66.7 per cent.

SUMMARY

Accurate data on the frequency of menstruation in 37 industrial and college women is reported.   The series includes 354 intervals.   This work supplements previous records on an older college group and supports the conclusions drawn from it on the irregularity of the occurrence of menstruation in normal women.

REFERENCE

King, J. L.: Contributions to Embryology **18**: Carnegie Inst. Wash. Pub. No. 363, pp. 79-94, 1928.

AN ANALYSIS OF 55 CASES OF HEMORRHAGE IN THE NEWBORN*

Leon H. Dembo, M.D., Cleveland, Ohio

(From the Departments of Obstetrics and Pediatrics of St. Luke's and St. Ann's Hospitals)

BIRTH hemorrhages are responsible for a large part of the neonatal death rate.   Intracranial hemorrhage has been reported present in as high as 50 to 75 per cent of deaths of newborns.   Of the cases surviving, many show later pathologic changes which retard the physical and mental development of these unfortunate infants.   Idiocy, epilepsy, and various forms of paralysis are often left in the wake of hemorrhages occurring at birth.

Santos, in a series of autopsies on 1387 newborns dying shortly after birth, found that in 22 per cent death was due to hemorrhage.   Kowitz reported 1014 cases of intracranial hemorrhage in a series of 5,989 autopsies.   In Schafer's series of 680 postmortem examinations, 140 showed intracranial hemorrhages.   Tyson and Crawford found that 32.1 per cent of stillborns that came to autopsy had hemorrhage.   Baily found the incidence to be 40 per cent in a series of 100 autopsies.   Additional statistics merely emphasize the alarming frequency of this condition and its menacing rôle in neonatal mortality.

In speaking of hemorrhage of the newborn, I have reference to two main types: (1) spontaneous bleeding or hemorrhagic disease, and (2) intracranial hemorrhage resulting from a number of etiologic factors.   The first type includes general oozing from mucous surfaces, prominent among which are those of the gastrointestinal tract.   The second classification includes hemorrhage involving the brain and meninges, resulting largely from traumatism.   A third classification, the so-called "hemorrhagic diathesis," has the aristocratic euphony of dermatologic terminology, reinforced with an etiologic vacuum.

In an analysis of 55 cases, taken from two hospitals in Cleveland, the sex incidence was about equal.   There were 39 (70.9 per cent) cases of intracranial hemorrhage, 15 (27.2 per cent) of the gastrointestinal type, and one (1.8 per cent) of umbilical hemorrhage.

TABLE I. ONSET OF SYMPTOMS

DAYS AFTER BIRTH					
DAY OF BIRTH	SECOND	THIRD	FOURTH	SIXTH	
24 (43.6%)	11 (21.8%)	13 (23.6%)	3 (5.4%)	3 (5.4%)	

TYPE OF HEMORRHAGE		
INTRACRANIAL	GASTROINTESTINAL	UMBILICAL
39 (70.9%)	15 (27.2%)	1 (1.8%)

SYMPTOMS					
CYANOSIS	CONVULSIONS	CYANOSIS AND CONVULSIONS	REFUSAL OF NURSING	FEVER	
31 (56.3%)	27 (49%)	18 (32.7%)	30 (54.5%)	25 (45.4%)	

TREATMENT	NUMBER OF CASES	BLOOD	RECOVERED	DIED	MORTALITY
Transfusion	7	20 to 70 c.c.	4	3	42.8%
Whole blood injections	19	5 to 50 c.c.	10	9	47.3%

Tables I, II, and III illustrate some interesting points regarding symptomatology, treatment, mortality, etc.

The largest number of cases showed symptoms on the day of birth, the second and third days after birth being the next most frequent time of onset. The important symptoms, cyanosis, convulsions and failure to nurse, occurred in a large percentage of cases.

From the standpoint of treatment, it is of interest to note the mortality rates in those cases in which transfusion or whole blood injections were given. A comparison with other case series (Table II) shows rather definitely the importance of blood therapy, the mortality rates being highest in the series in which the least number of cases received transfusions or blood injections. The series of Fall is especially convincing.

The obstetric record (Table III) reveals some interesting data. Only 12 cases in the present series were spontaneous deliveries. Almost 50 per cent were delivered by forceps. The labor periods varied from two to fifty-six hours, with an average of about nine and one-half hours. Position and presentation were normal in a majority of the cases. There were 2 cases of toxemia, 3 preeclampsias and 1 eclampsia in which delivery was affected by cervical cesarean section.

Lumbar punctures were done in 18 cases, in 10 of which bloody fluid was obtained. There were only 8 autopsies in this series, tentorial tears being found in 4 cases.

TABLE II

AUTHOR	NUMBER OF CASES	TREATED BY TRANSFUSION	NUMBER DIED	MORTALITY PER CENT
Townsend, 1894	50	None	31	62.0
Robertson, Brown and Simpson, 1921	43	All	1	2.3
Fall, 1923	14	All	0	0.0
Beveridge, 1926	24	2	8	33.3
Present Series, 1932	55	7	29	52.7

The mortality in this series was 52.7 per cent. The mortality in the cases treated by transfusion was 42.8 per cent, while in those which received whole blood injections the rate was 47.3 per cent. Of the 29 cases which received no blood therapy, 17 died, giving a rate of 58.6 per cent.

TABLE III. DELIVERY

	PROPHYLACTIC	HIGH	MID	LOW
Forceps	10	1	5	9
Spontaneous	Breech Extraction	Bag Induction	Version and Extraction	Cesarean Section
12	4	3	7	1

From the available statistics on intracranial hemorrhage, particularly as applied to tears of the tentorium, it is apparent that the greatest single etiologic factor is trauma. One finds, however, that in a certain number of cases this factor is considerably reduced, and yet the pathologic picture is essentially the same.

The following case illustrates this point:

Baby R., a fullterm male child, was delivered by classical cesarean section. Resuscitation was difficult and was accomplished by means of mouth-to-mouth breathing and the tracheal catheter. Almost immediately after birth he began having tonic seizures with slight cyanosis. There were 40 c.c. of paternal blood injected subcutaneously, oxygen was administered and 1 c.c. of Lobelin injected. The symptoms, however, continued and the baby died fifty-five minutes after birth. The mother had a justominor pelvis with disproportion. She was given a trial labor, but after twelve hours made no progress. During this period, the uterine contractions were strong and occurred every three to five minutes. The cervix did not dilate. Shortly before delivery the fetal heart rate was 130. After twelve hours, delivery was affected by section.

Autopsy Findings.—The right fold of the tentorium close to the junction of the petrous portion of the temporal bone and the right lateral sinus showed a small tear through which some blood was oozing. On opening the tentorium there was found a moderate subdural hemorrhage completely surrounding the cerebellum. There was marked edema of the leptomeninges.

Histologically the lungs showed the walls of the alveoli heavily infiltrated with red cells. In one area the alveoli were filled with polynuclear leucocytes and red blood cells. The bronchi contained a similar exudate. In other areas the alveoli were partially collapsed. The *liver* showed congestion of the sinusoids with moderate myeloid infiltra-

tion. Several small hemorrhages were demonstrable in the granular layer of the cerebellum.

In this case it seems not unlikely that the hemorrhages were induced by asphyxia incident to the trial labor. The manner of delivery precludes the element of delivery trauma. As contributing factors we might consider the pressure results on the fetus from constant uterine contractions with no resultant dilatation of the cervix. It seems reasonable to assume that in many cases the damage is done in utero and not during the process of delivery.

7016 EUCLID AVENUE.

OSTEOGENESIS IMPERFECTA

JAMES P. HENNESSY, M.D., F.A.C.S., NEW YORK CITY

(From the St. Anne's Maternity Service)

MARY G., aged twenty-two, single, admitted to Prenatal Clinic shortly before delivery. According to history obtained from mother of patient, who was unable to speak English, she was one of twins, neither of whom was vigorous in childhood, and was born in Porto Rico, where they have resided most of their lives. No history of rachitis in mother or children. The mother has always been a vigorous and hard working woman. Her pregnancies have been uneventful. Two children died in early infancy; one in a convulsive attack, the other of typhoid fever. The father, an American soldier stationed in Porto Rico during the Spanish-American war, has not lived with the mother for several years and is reported by her to be insane. The previous history of the patient showed nothing of significance except an appendectomy three years before admission. It was found that the mother had been treating the patient for amenorrhea for almost six months by the administration of large quantities of a special preparation of Spanish origin, containing as chief ingredients quinine and ergot. She denied knowledge of the existence of pregnancy until about the sixth month, after which abortifacients were discontinued. Physical examination showed a somewhat undernourished young Porto Rican with following pelvic measurements: interspinous 22.5; intercrestal 26.5; external conjugate 15.5; conjugate vera 10.25; right oblique 21; left oblique 20.5; tr. outlet 7.5; depth of symphysis 7.

Laboratory Findings.—Blood Wassermann negative. Red blood cells 2,450,000, Hb. 45 per cent. White blood cells 8,000; polymorphonuclears 76 per cent, monocytes 20 per cent, trans. 2 per cent, lymphocytes 20 per cent. Blood chemistry: blood sugar, 105 mg. per 1,000 c.c., nonprotein nitrogen 25 mg., blood calcium, 7 mg., blood phosphorus, 5 mg. Moderate poikilocytosis. Urine negative except for a slight trace of albumin.

After a short trial labor, a classic cesarean section was performed, with delivery of an apparently living female child. The patient left the operating room in good condition, made an uneventful recovery and left the hospital within three weeks.

The child appeared moderately cyanotic. No cry was elicited and no respiratory movements observed. The head showed slight cephalematoma over both cranial bosses. The anterior fontanelle was open. Neither craniotabes nor fracture of the cranial vault was found and a blood Wassermann taken from the fontanelle was negative. Eyes showed slightly bluish sclerae and some edema of the right lid. Ears and mouth negative. Heart sounds weak, irregular and slow. No breath sounds audible. Liver and spleen not palpable. Moderate left scoliosis in lumbar region.

The most important findings were in the extremities, both arms and legs being so flexible that they could almost be tied in knots. There were bilateral fractures of

humerus, femur, tibia and fibula, bilateral ankylosis of elbow and knee joint, bilateral club claw hand and bilateral talipes varus.

Heart sounds ceased ten minutes after delivery.

Necropsy.—Body that of a white female newborn child, about 48.5 cm. in length. General formation of head and trunk apparently normal. Arms and legs very flexible and abnormally twisted, the feet being in the position of talipes varus on the right and talipes valgus on the left side. Marked edema and lividity of right side of face, the eyelid being so swollen that the eye was invisible. Fontanelles normal. A few bony plates in the membrane about the sagittal suture. The right orbital plate could be separated from the other bones by simply turning back the scalp and the right temporal bone also was loosely attached. No other abnormalities were found in the skull and all bones were of good thickness and well calcified. The organs of the neck were normal, as were the hypophysis and pineal gland.

The pleural cavities were extremely small and highly placed, due to the small size of the lungs (each measuring 2.5 by 1.5 cm.), and contained a considerable quantity of

Fig. 1.—General view of fetus.

slightly blood-tinged fluid. Both lungs were in complete atelectasis, with no distinct division into lobes. One bronchial branch entered each lung and showed normal terminal bifurcation. Thymus normal. Heart normal, though high in position.

The peritoneal membrane was normal. The liver was normal in size but extremely high in position, the dome extending upwards to the second intercostal space on the right and nearly as high on the left, and the lower margin being situated about 3 cm. above the umbilicus; this malposition was due to the small size of the lungs. The character of the liver parenchyma appeared normal and the spleen average in size for a newborn child, the follicles visible and of usual number and size. Adrenal glands, kidneys, pancreas, gastrointestinal tract, and pelvic organs normal. The spinal column showed a distinct left scoliosis in the dorsolumbar region.

Examination of the skeleton revealed several fractures of both upper and lower extremities which, on section, showed no sign of fibrous union. Both elbow and knee joints were immobile and section showed that the joint cavities were filled with hemorrhagic fibrocartilaginous granulation tissue. Bones of all extremities, although normal in length were extremely slender and easily bent and broken. Bones of the skull, spinal column and pelvis were of average thickness and hardness, the only abnormalities being defective union of some of the sutures and irregular ossification of the membranes in the

mesial parietal bones (bony plates). Longitudinal section of the long bones showed very thin cortex and trabeculae, with correspondingly large and very cellular marrow cavities.

Fig. 2.—Showing slender imperfectly formed trabeculae with large immature osteoblasts in the matrix.
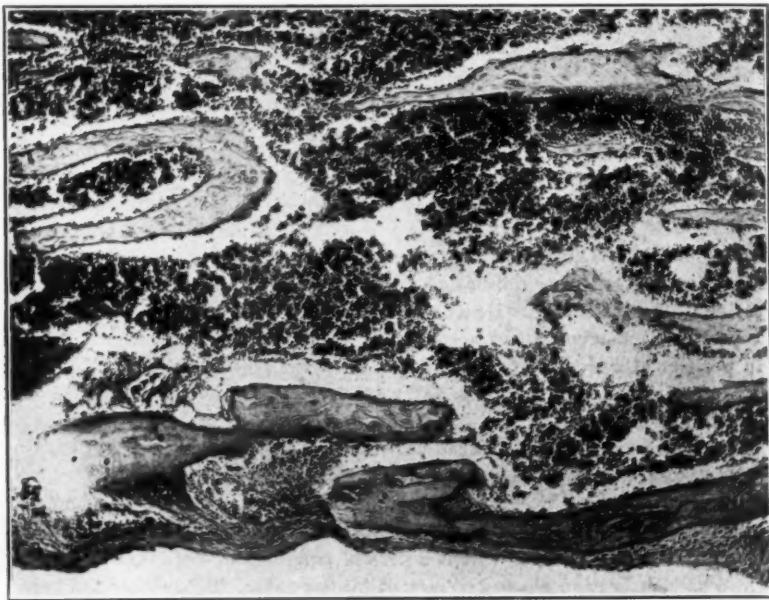

Fig. 3.—At bottom thin periosteal bone, partly fibrous (not healed fracture). Long irregular clefts for Haversian canals. Abundant marrow.

Histology.—No signs of repair or regeneration in fracture areas were found, the fractures being apparently recent and without reaction. The junctional area between cartilage and bone in the long bones was normal. The columnar formation of cartilage

and calcification, that is, the preparation of the cartilage for replacement by bone, was perfectly normal. The newly formed bone trabeculae replacing the cartilage columns were slender and the osteoblasts remained immature for a long distance down the shaft. In many trabeculae the central mass of calcium of the cartilage column was not replaced by osseomucin, the trabeculae even in the middle of the shaft consisting of large, much swollen osteoblasts without osteoid matrix and of course containing no calcium (Fig. 2). The matured trabeculae were extremely thin and the osteoblasts few. The Haversian systems of the compact bone of the cortex were either lacking or malformed, the Haversian canals and lacunae being frequently represented by long, irregularly branching clefts (Fig. 3). The periosteum was exceedingly thin, with few osteoblasts, and the periosteal bone formation decidedly defective. The medullary canals were large, especially at the epiphyseal ends, and the marrow cells abundant, the different elements being in the normal proportion. Sections were not made from the membranes or short bones.

The histologic structure of the lungs was normal.

In view of the fact that Fahr recently reported a case of osteogenesis imperfecta in which he found precocious maturing of the endocrine organs, particularly the ovary, a careful study was made of all the endocrine organs and the findings compared with those in the same organs from newborn children dying from other causes. No changes were found in this case which were not also common to the others.

In short, the only pathologic changes found in the bones consisted of defective periosteal and endosteal bone formation. The osteoblasts were defective in number, matured very slowly and failed to produce sufficient osseomucin for proper calcification, although such osseomucin matrix as existed became calcified in a normal way, as opposed to the excessive proliferation of osteoid tissue seen in rickets. The preparatory changes in the cartilage in growing bone were perfectly normal. The maldevelopment of the lungs was an associated anomaly which, so far as is known, has not been previously reported in a similar case. In view of the fact that the great majority of cases reported have been in females, especial attention was given to the study of the ovaries.

Conclusions.—The work of Kraus was repeated and confirmed in the case of osteogenesis imperfecta here described, in which a special study of the endocrine organs was made. The anatomic findings did not support the theory of deficiency or overproduction of internal secretion, and it seems unlikely that morphologic study alone will solve the problem of the etiology of this disease.

Phillips, Miles H.: Obstetric Shock, Brit. M. J. 1: 833, 1931.

The author discusses surgical shock from obstetrical procedures, in the main, unassociated with hemorrhage. Emphasis is placed on watching the blood pressure; a drop in pressure being possibly the best early clue of impending shock. Perineal tears may be a very definite factor in the production of obstetrical shock as it is well known that trauma to skeletal muscle is especially liable to induce shock.

Hemorrhage, a contributory factor, should always be guarded against by the usual prophylactic means. Nitrous oxide and oxygen are definitely safer as an anesthetic in regard to shock than are ether and chloroform. One should avoid exposure of the parturient woman to cold but conversely the application of too much heat while treating shock may produce sweating which will further deplete the patient's fluids.

Wounds of the genital tract are better left unrepaired for a few days if the patient be in shock.

The author stresses restoration of the volume of blood plasma as the paramount feature of the therapy by saline, glucose solution and best of all blood. The author also advocates gum saline solution.   HUNT.

REPORT OF A CASE OF FIBROMA OF THE VULVA WITH SARCOMATOUS DEGENERATION*

HARRY M. NELSON, M.D., F.A.C.S., DETROIT, MICH.

THE case I wish to report is of interest, not so much because of the relatively rare occurrence of fibroma of the vulva, but because in this case we have been able to obtain accurate records, including pathologic specimens and photographs of these tumors showing their gradual change in morphology, over a period of thirty years.

Clinical History.—The patient is a white American, aged seventy-three. She has had four children and one abortion. Other than the local trouble the past history was of no consequence.

Forty-five years ago she noticed a small bean-sized lump in the upper third of the left labium majus. It did not change much in size until she became pregnant thirty-seven years ago. At that time the growth increased to the size of a walnut and was removed after her first child was born. Five years later another growth, similar to the first one but situated lower on the left labium majus, appeared. This was removed also.

On August 25, 1902, she was admitted to the University Hospital, Ann Arbor. The following description was taken from Burr's report which was given before the Michigan State Medical Society Meeting in Detroit, June 8, 1903. At that time there were three distinct growths. The upper, as large as a hickory nut, apparently developing from scar tissue, presented a median furrow and was fixed. The middle nodule, a little larger, was slightly movable, and rather soft. It was smooth, well outlined, and seemed to be connected with the larger mass below. The third and lowest growth was the size of a large walnut. All three of these tumors seemed to have their origin in the tissues of the labium majus, but the lowest two encroached somewhat upon the labium minus and the perineum. The patient was operated upon on August 26, 1902. All the tumors were readily enucleated. They were classified as "fibroma molle" (Fig. 1).

The patient consulted Dr. Peterson at the University Hospital, Ann Arbor, again in 1915. At this time there were more tumors and a radical excision of the left vulva was done. The pathologic report on the specimens was "fibromyoma molle, approaching the fibrosarcoma type" (Fig. 2). Dr. Peterson saw her again in 1917 and 1921, but at these examinations there was no evidence of recurrence.

The difficulty for which I saw her began in December, 1930. A small nodule was noticed in the right labia. This had increased quite rapidly in size and soon involved most of the labia and extended to the perineum. In January, 1931, she saw a "cancer cure specialist" because she felt that she had had too many operations. He gave her serum treatments during January and February. However, there was rapid growth of the tumors and during the latter part of February the growth broke down and exhibited a foul smelling discharge. From that time until we saw her she was confined to bed most of the time, had moderate grade fever, and lost weight rapidly.

The temperature was 100° F., she weighed 99½ pounds. Local examination revealed a large, sloughing growth covering the perineum, extending into the vagina, and involving the anal orifice. Above this on the right labium majus were several

*Read before the Detroit Gynecological and Obstetrical Society, Dec. 7, 1931.

nodules, two of them quite soft. The nodules near the anterior portion of the labium were small and firm (Fig. 3).

On March 18, 1931, radical excision of the right labia, including a portion of the posterior vaginal wall, perineum, and rectal sphincter, was done. This was done under spinal anesthesia with the radio knife. She made a satisfactory recovery
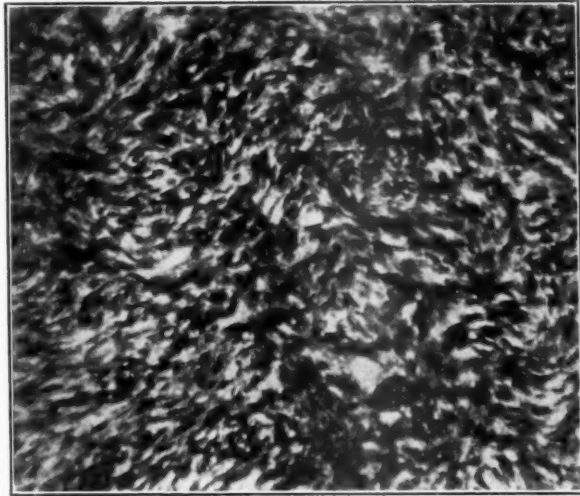

Fig. 1.—Photomicrograph of the specimen removed in 1902. Medium power. Shows cellular tissue arranged in interlacing whorls; cells abundant but of uniform size, shape and staining quality. No mitosis found.
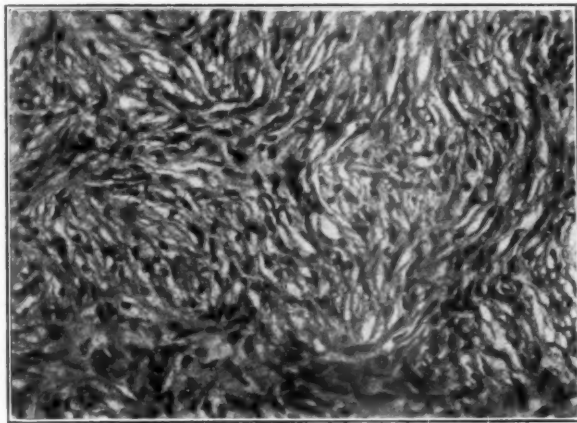
Fig. 2.—Photomicrograph; medium power of specimen removed in 1915. Shows cellular whorls of tissue; interlacing cells, larger and more hyperchromatic than specimen of 1902. No mitosis seen.

and left the hospital in two weeks. The pathologic examination of this tissue showed fairly definite fibrosarcoma (Fig. 4).

Since then the patient has felt very well. She has been active, afebrile, and has gained weight. When seen November 11, 1931, there was no evidence of recurrence. Weight 104 pounds.

Fibroma of the vulva is the most common of the solid, benign tumors of this region. However, only 175 cases are reported in the literature. Burr did not

find any other cases in 5000 gynecologic admissions at the University Hospital, Ann Arbor. Leonard reported 6 cases in 23,000 gynecologic admissions to the Johns Hopkins Hospital. His review of the literature and classification of the tumors is the most thorough at the present time.
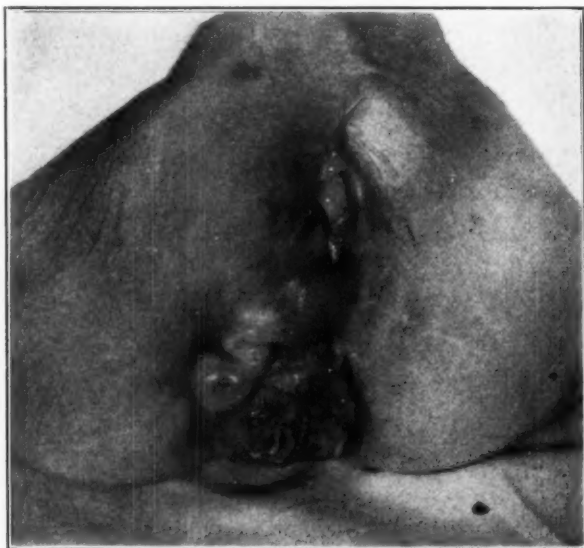

Fig. 3.—Photograph taken in 1931; showing the extensive sloughing growth involving the entire right labium and the perineum. The scar of the previous operation on the left labium can be seen.
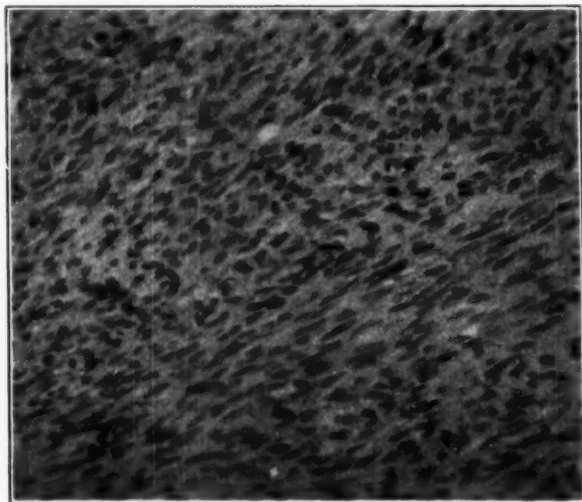

Fig. 4.—Photomicrograph; medium power, of section removed in 1931. Shows tissue composed of cellular whorls; nuclei are much more abundant than in previous sections, and vary in size, shape, and staining qualities. Mitosis can be seen in nearly every field.

Note.—Since this report the patient has had another tumor develop. This appeared in the posterior angle of the scar made by Dr. Peterson in 1915. It began to develop during the latter part of January, 1932. When seen in February, there

was an area of ulceration 1½ cm. in diameter, and an area of induration 2½ cm. in diameter. It was situated just to the left of the anus on the perineum. The entire tumor was excised February 24, 1932. The pathologic picture was the same as that in the tumor which was removed in March, 1931.

PERFORATION OF A FIBROMYOMATOUS UTERUS, FOLLOWING VERSION

Henry W. Weber, Brooklyn, N. Y.

(From the Obstetric Service of the Jewish Hospital)

MRS. R. J., aged thirty-nine, para vi, at term, was admitted to the Jewish Hospital on March 12, 1930, at 9 A.M. Previous pregnancies were all normal, with full-term deliveries, and babies six pounds or less in weight. She had not been observed in any prenatal clinic. Patient gave a history of headaches, dizziness, diplopia, epigastric distress during the past month. Patient was admitted after a sixteen-hour active labor with ruptured membranes and unsuccessful attempt at version.

Heart and lungs were negative. Abdomen tonically contracted, retraction ring felt. Fundus 2 fingers below xiphoid. Fetal heart right upper quadrant. The cervix four fingers dilated, rather thick, with hand and foot protruding. Apparently a version had been tried but not completed.

At 10 A.M., one hour after admission, a version was performed, bringing one leg down to the vulva. The patient was allowed to come out of chloroform anesthesia. Hearing of fetal heart was questionable after the version. At 11:30 A.M., the patient had a spontaneous breech delivery up to the shoulders when considerable difficulty was encountered. With Smellie-Veit manuever impossible because of the large head, and because of absence of fetal heart, the head was perforated, considerable fluid escaping with the delivery of a 9-pound baby with hydrocephalus. Placenta and membranes were expressed intact.

On the third day postpartum, the temperature rose to 104°, pulse 110. Fundus was three fingers above the umbilicus, not tender, abdomen soft, no distention, no tenderness. It was thought temperature could be accounted for by intrauterine manipulation. Catheterized urine specimen showed specific gravity of 1.014; 2+ albumin and many hyaline casts. Blood culture sterile, 13,000 white blood cells, 80 per cent polymorphonuclears.

The patient continued a septic course, with marked anemia (less than 2,000,000 red cells, 35 per cent hemoglobin). The abdomen remained soft until the thirteenth day, when it became distended, vomiting came on and a diagnosis of partial intestinal obstruction with a pelvic peritonitis, seemed justified. After twenty-four hours of conservative treatment, a laparotomy was done and free fluid found together with plastic exudate and adherent omentum. A jejunostomy with drainage was carried out. Immediate postoperative recovery poor, septic temperature continued and a bronchopneumonia developed on the fifth day and patient died on the fourteenth day after operation.

At the postmortem examination the following conditions were found: gangrenous metritis with perforation, gangrene of the uterine fibroma, suppurative peritonitis, cloudy swelling of heart muscle, fatty degeneration of liver, infectious splenomegaly, hyperplasia of adrenals, toxic nephrosis, and hyperplasia of bone marrow. In detail, as follows: The vaginal mucosa had become converted to an ulcerated necrotic membrane. The external os was patulous. The entire endometrium was necrotic and

shaggy and exceedingly foul smelling. At the fundus there was a large perforation that included most of the fundus. The perforation was protected by matted loops of ileum. The endometrial cavity was occupied by a large submucous fibroid, that was soft, degenerated and the mucous membrane lining was entirely necrotic. The wall of the uterus contained several small firm, fibroid masses and most of the wall was replaced by fibromyomatous tissue. Both tubes and ovaries were present. The right tube was markedly congested. The uterus had entirely involuted. The pelvic veins showed fluid blood in all of them.

Microscopically, the mass inside the uterus showed the structure of fibroma. The musculature was the seat of a gangrenous and necrotic process, infiltrated with polynuclears.

This case presents the following interesting points:

1. Perforation of the uterus following version and spontaneous breech delivery.
2. Intestinal obstruction due to nature's attempt to close perforation.
3. Perforation of the uterus not diagnosed due to lack of signs and symptoms.
4. Death due to general peritonitis and intestinal obstruction.

DISCUSSION

DR. JOSHUA RONSHEIM.—I do not think this was a rupture of the uterus. In this patient at the time of operation a gangrenous mass was extruded from the abdominal cavity through the surgical operative wound which I was thoroughly convinced was a gangrenous fibroid, and I think the perforation of the uterus was due to the sloughing of the fibroid involving the uterine wall and not to traumatic rupture.

DR. O. PAUL HUMPSTONE.—I had a similar case, a third para who was delivered by one of my colleagues. This patient had a fibroid on the right lateral wall of the uterus. She had considerable dystocia in her labor for no apparent reason, and he did a version upon complete dilatation. It was not really a submucous fibroid, but an intramural fibroid about the size of an orange, which extended into the uterus rather than out. Rupture occurred in this case after a perfectly straight-forward, fairly easy version. The rent was just above the fibroid toward the fundus on the lateral wall of the uterus. It is my opinion that it is some part of the fetus that catches on the fibroid and pulls down on it, and that the fibers around the fibroid in the upper part of the uterus are attenuated and give way. This patient went at once into deep shock and died before anything could be done, in fact before an accurate diagnosis was made.

I think that every fibroid uterus delivered by version or forceps should be carefully explored after delivery, to determine that there is no rupture.

DR. GEORGE KORNFELD.—I just want to correct a false impression that Dr. Ronsheim left of this case. The mass that Dr. Ronsheim spoke about, was not found at the time of operation, but two or three days postoperative when it was passed through the drainage wound. There were no signs of any perforation of the uterus at the time of delivery or after.

PELVIC SPLEEN WITH TORSION OF PEDICLE*

E. A. BULLARD, M.D., NEW YORK, N. Y.

(From the Service of Woman's Hospital, New York City)

ON SEPTEMBER 4, 1930, Mrs. B. H., aged twenty-two, colored, acutely ill, entered the Woman's Hospital. Her chief complaints were severe pain and tenderness in a large mass occupying the lower abdomen.

The history was as follows: Injury to her dorsal spine in infancy had resulted in permanent pronounced lordosis. Beyond this she had had no major ailments though always frail and underweight. Married five years; three spontaneous labors and one early miscarriage. For the previous fifteen months she had noticed an insensitive mass in her lower abdomen which had become tender and painful. About three weeks before admission to the hospital the pain drove the patient to bed, and for the last three days it had been constant and excruciating, vomiting had been frequent and injections of morphine necessary. Considerable uterine hemorrhage appeared on the night before admission, five days ahead of the expected menstruation.

On examination the patient was found to be an emaciated colored girl five feet tall and weighing only 89 pounds. There was a marked lordosis in the thoracolumbar region, a finding which later appeared to have had some influence in the production of her chief lesion. The heart and lungs were normal. The abdominal wall was remarkably thin, there was no distention. Occupying the middle of the lower abdomen was an exquisitely sensitive mass of uncertain consistency, about six or seven inches in diameter, its upper border at the umbilicus, and palpation of its top had the feel of the edge of the liver. Bimanual examination of the pelvis located this mass above and in front of the uterus, which latter felt normal and quite mobile. Uterine appendages not identified because of great tenderness everywhere. The patient's pulse ran from 110 to 120, her temperature averaged 103° F., three leucocyte counts averaged 8000 and polys 80 per cent, the red cells numbered 3,600,000, the sedimentation time was sixteen minutes the first hour, and the urine was normal.

The impression was that this tumor was an ovarian cyst or a pedunculated myoma of the uterus with a twisted pedicle.

Laparotomy appeared to be imperative and was accordingly done. Immediately underneath the abdominal incision the spleen presented itself. It was very deeply congested, dimensions 7 by 5 by 4 inches, its upper border at the umbilicus. The pedicle was also very deeply congested, at least 8 inches long, and appeared to consist only of elongated vessels, peritoneum and cellular tissue. Seven complete turns were required to entirely untwist this pedicle, which, at its narrowest point, was only about a quarter of an inch in diameter. Thin recent omental adhesions were readily released from the spleen and pedicle, and the latter was doubly ligated with No. 3 chromic catgut about two inches from its origin and the spleen cut away. The kidneys were felt well up in position and normal, uterus, tubes, and ovaries normal, but there was a marked ptosis of the stomach and transverse colon.

The operation was short and free from shock but a transfusion of 500 c.c. was given immediately thereafter in view of the anemia and the gravity of the case.

The pathologist's report of sections through the spleen was interesting. ''There is far advanced necrosis of the splenic parenchyma, only fragments of trabeculae or islands of lymphatic tissue and small blood vessels can be distinguished in the masses of extravasated blood and the matrix of connective tissue. The capsule is necrotic, thickened and without distinct borderline from the parenchyma.''

Convalescence was entirely uneventful and easy. Blood count ten days after opera-

tion showed an adjustment to the loss of the spleen, as there were 4,300,000 red cells, a hemoglobin of 85 per cent, 9,400 white cells, 65 per cent polynuclears, 34 per cent lymphocytes, and 1 per cent transitionals.

Wandering spleen has been reported many times, the organ having been found in all parts of the abdomen, especially in the left lower portion, rarely as the contents of umbilical, ventral, and diaphragmatic herniae. Almost invariably when in or near the pelvis it has been confused with a twisted pedicle ovarian cyst. In my case it seems reasonable to assume that the chief causative factors were the asthenia and emaciation, and the pronounced forward bowing of the spine in the upper lumbar region.

40 EAST SIXTY-FIRST STREET.

TUBAL PREGNANCY AT TERM

B. B. WECHSLER, M.D., NEW YORK, N. Y.

PATIENT, N. H., colored, aged thirty-six, married twenty-one years, first seen by me, January 27, 1928, with a complaint of generalized abdominal pain of sudden onset.

Last menstruated April, 1927. She had slight morning nausea at first, but no vomiting. There were occasional headaches, but no vertigo. There had been some urinary frequency. Quickening was first noted in August, 1927, and continued until onset of abdominal pain. According to this history the expected date of confinement would be about January, 1928.

There had never been any menstrual disturbances since onset at age of fourteen. No urinary disturbance, nor vaginal discharge at any time. She married at the age of fifteen, and the following year was delivered of a nine pound living child. The delivery was spontaneous, and the puerperium normal. She did not conceive again until 1926. At this time a diagnosis was made in about the sixth week of a left tubal pregnancy, and that tube was removed. Other than this the history was not significant.

Physical examination was entirely negative, except abdomen. This presented a globular mass which corresponded in size to a pregnant uterus at term. There were apparently no contractions though the patient complained of cramp-like pains. There was no tenderness. Fetal heart sounds were not audible. Fetal parts were readily mapped out. The presentation was vertex. Bimanual examination revealed a soft, but elongated cervix, and the fetal head could not be reached by the examining finger. The culdesac was empty. There was a slight inoffensive bloody discharge from the vagina. The temperature was 100°. With rest in bed the pain soon subsided. She remained in bed for three weeks with no change in the findings.

On February 23, one month later than the expected date of confinement it was decided to induce labor. A sterile rectal tube was introduced into the uterus, and the vagina packed with sterile gauze. Within twelve hours the tube, and gauze were expelled. A second attempt was made, but this time it was impossible to insert the rectal tube far enough. Cesarean section was decided upon notwithstanding the presence of a dead fetus and done on March 4, when about five weeks past due. A median line incision was made in the usual manner. The peritoneum was found firmly adherent to the underlying mass. This was separated with difficulty, and the mass found to be encased in a thin friable greyish red sac, which in no wise resembled myometrium. Incision into this sac was not followed by bleeding. A slightly macerated female fetus was delivered. It weighed eight pounds, ten ounces, and measured 50 cm. in length.

The greyish red sac was found to be the right tube.

The placenta was adherent to the tubal sac and it in turn was adherent to the bowels and appendix. The sac and placenta were removed together with difficulty. The appendix was also removed. The uterus was found small and free and had been lying posterior to the tubal mass.

The patient had a comparatively uneventful recovery. The temperature remained elevated to 100° F. for about two weeks. She was discharged from the hospital on April 4 fully recovered.

REPORT OF A CASE OF LEUCOKRAUROSIS (KRAUROSIS VULVAE) CURED BY VULVECTOMY*

Theodore Neustaedter, M.D., L.M. (Dublin), New York, N. Y.

(From the Gynecological Service of the Central Neurological Hospital, Welfare Island, N. Y.)

WHILE leucokraurosis is not uncommon in gynecologic practice, complete unanimity as to nomenclature and pathology does not exist. Graves and Smith[1] have suggested the term leucokraurosis and have clearly shown that kraurosis vulvae is not a disease entity, but a late stage of leucoplakia of the vulva. Szasz (cited by Graves and Smith) differentiates the pathology of the two stages. The etiology is still a moot question.

This case report is of interest because it further stresses the value of surgical treatment for its cure, since all other measures have been proved to be palliative only.

CASE REPORT

Mrs. M. D., Spanish, aged sixty-nine, widow, no children, was admitted to the gynecological service August 16, 1931. She complained of intense itching of the external genitalia, pain, and burning on micturition. The family history is irrelevant. Menstrual periods normal, menopause at forty-seven. One pregnancy which aborted at three months. Pneumonia at nine, and typhoid at ten years of age. Cataract operation on both eyes eight years ago.

Five years ago she was operated upon for a uterine tumor, myomectomy. At that time she suffered from vaginal bleeding, which terminated three weeks after the operation, abdominal pain, tenesmus, and dysuria. Some months later itching of the external genitalia set in. The pruritus was not constant; there would be intervals of several weeks when she was completely free from this annoyance. As time went on, the intervals grew shorter and insomnia set in. She also developed a thick yellowish discharge. This symptom complex grew steadily worse. About one year ago she was treated with topical applications and then x-ray therapy which met with temporary success only. For the past year there has been pain around the introitus. At the present time her itching is very severe and continuous, she cannot refrain from scratching the vulva, and urinary frequency, nocturia, dysuria, and tenesmus are present. Appetite fair, no digestive disturbances, but is constipated.

The patient appeared to be in good physical condition. Blood pressure 180/100.

Bimanual examination was impossible due to contracture of the introitus. The external genitals were painful to the touch. The labia majora were atrophic and labia minora were absent. On the labia and on their inner surfaces, extending from the clitoris to the posterior commissure, were hard, white, dry, slightly raised, parchment-like excrescences. Superimposed were two small elevations the size of ten-cent pieces, also somewhat hard. Rectal examination did not reveal any pelvic pathology.

A preoperative diagnosis of leucokraurosis (kraurosis vulvae) was made. On August 28, 1931, under ether anesthesia a vulvectomy was performed. The incision was carried from above the clitoris downward and backward on each side to the fourchet including both labia majora and describing a complete oval about the entire vulva, separating the healthy from the diseased tissue. A second incision was made around the vaginal orifice being carried up anteriorly across the vestibule so as not to encroach too closely

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upon the urinary meatus. All the tissues between these two incisions down to the deep fascia were dissected free in a single piece, blood vessels being clamped and ligated as they were cut. A mattress suture was placed through the base of the clitoris to insure no future bleeding from the basilar artery. The margins of the skin were undercut for a short distance, as well as the edges of the mucosa about the urethra and the vaginal introitus. The subcutaneous tissues above the level of the urethra were brought together with interrupted chromic catgut sutures, to prevent dead space and overcome tension. Approximation of the skin margins above the urethra was secured by continuous black silk suture and this line of suture was carried down on either side, uniting the cutaneous and vaginal mucosa edges. A light iodoform gauze packing was placed in the vagina.

On the first two days the temperature rose to 101° and pulse was 110. This receded to normal quickly thereafter. The incision healed by primary intention. The patient was kept at complete rest in bed for three weeks. The itching disappeared completely but occasionally the patient complained of a contracting sensation. On two occasions there was acute retention of urine but the catheter passed into the bladder without any difficulty. At the present time there is a vaginal orifice the size of a 25-cent piece which allows for comfortable urination and any vaginal secretion which may be present.

The pathologist's report (Dr. V. Dolgopol) stated that microscopically the epithelia on the surface presented extensive hornification. This process in places appeared to be proceeding with considerable rapidity, judging from the abundance of cells that were speckled with eleidin. No excessive proliferation of cells was seen at the basal layer. The layer of active epithelial cells was quite thick in some places, while in others it was limited to just a few cells below the hornified area. The underlying connective tissue presented considerable hyalinization and showed evidence of chronic inflammation (infiltration with lymphocytes and plasma cells, formation of lymphoid follicles, and occasional giant cells).

NOTE: January 18, 1933. The patient is in very good condition today, none of her previous symptoms have returned, and she is able to attend to her daily duties without difficulty.

REFERENCE

Graves and Smith: J. A. M. A. **92**: 1244, 1929.

27 EAST NINETY-THIRD STREET.

A CASE OF UNILATERAL OVARIAN APLASIA AND HOMOLATERAL RUDIMENTARY FALLOPIAN TUBE ASSOCIATED WITH A NORMALLY DEVELOPED UTERUS

NICHOLAS M. DE SANCTIS, M.D., AND J. SANTE DIASIO, M.D.,
NEW YORK, N. Y.

NO MENTION was found in the literature of the occurrence of unilateral absence of the ovary and an homolateral rudimentary tube with a perfectly formed uterus which had normally discharged the functions of menstruation and procreation. Because tubal anomalies in all instances are found with similar uterine malformations, and because unilateral absence of the ovary is usually associated with an unicornate uterus, this unique case is reported.

Mrs. R. B., aged forty-three, married eighteen years. She has had five pregnancies to term. Her youngest child is five years of age. There has been one miscarriage five years ago. The menses had been regular and of four days' duration up to four years ago. Venereal infection is denied. The family history is irrelevant. No operations.

The patient was seen by the senior author on April 15, 1932, complaining of metrorrhagic and menorrhagic bleeding for the past four years subsequent to a supposed miscarriage. The menorrhagia was ten days in duration and accompanied by passage of large clots. During the last four years the patient consulted a number of physicians for the alleviation of her uterine bleeding for which she was subjected on four different occasions to a therapeutic curettage without relief. The metrorrhagia and menorrhagia had become so severe during the three months' period prior to my consultation that the patient was obliged to make the rounds of several local hospitals where in each instance surgical intervention was advised for her condition. The other troublesome symptoms that the patient complained of were loss of weight, loss of forty pounds within the last four years, pelvic discomfort, asthenia, backache which became intense with every attack of menorrhagia, and marked pain over the left adnexal area.

Physical Examination.—The patient was emaciated and pale, moderate arcus senilis was present. The pupils reacted normally to light and accommodation. The head and neck were normal, and the nose and throat clear. The heart was normal in size, position, rate, and rhythm. The lungs were clear. The radials were slightly thickened and easily palpable. The blood pressure was 120/80. Abdominal examination revealed bilateral ptosis of the kidneys and tenderness over the left adnexal region on pressure. On pelvic examination the anterior and posterior vaginal walls were found to be slightly relaxed, the cervix hypertrophied and bilaterally lacerated, the uterus symmetrically enlarged to the size of a six weeks' pregnancy. A cystic mass as well as a tender, enlarged tube were palpated in the left fornix. Nothing was felt in the right vaginal fornix.

Laboratory Examination.—The blood Wassermann was negative with both the alcoholic and cholesterol antigens. The blood sugar was 0.12 per cent. The blood examination showed: red cells 3,450,000, hemoglobin (Dare) 65 per cent, leucocytes 8,100, polymorphonuclears 74 per cent, large lymphocytes 1 per cent, small lymphocytes 25 per cent. Urinalysis showed a trace of albumin, sugar, and casts negative, pus cells four per high power field, a few calcium oxalate crystals, and a few epithelial cells.

Clinical Diagnoses.—(1) Fibrosis uteri; (2) left cystic ovary; (3) left chronic salpingitis; (4) hypertrophied and bilaterally lacerated cervix; (5) bilateral ptosis of the kidneys. Operation was advised and patient referred at once to the Columbus Hospital.

The abdomen was opened under ether anesthesia. Half of the left ovary was found to be cystic and was properly resected. The left tube was enlarged, chronically inflamed, kinked, and attached by adhesions to the omentum. The uterus was well-formed, smooth, symmetrically enlarged to the size of six weeks' gravidity. The right tube was short, 3.5 cm. in length, of normal width and with a blind distal extremity. The right ovary was absent and was not found after a careful search on the right side of the upper pelvis, the iliac fossa, the groin, the labia or even in the remote retroperitoneal regions where the ovary may lie displaced. Both kidneys were ptosed and easily palpable. A supravaginal hysterectomy was performed.

Examination of the specimen showed a perfectly developed and symmetrically enlarged uterus with two well formed cornua to which were attached a left enlarged and chronically inflamed tube and a right rudimentary tube, 3.5 cm. in length. The right tube was patent for half of its distance. Section of the right tube disclosed evidence of the presence of mucosal, muscular and tunica adventitia layers with only the inner half covered by peritoneum. Microscopic examination of the uterus, left tube, and ovary confirmed the clinical diagnosis.

The patient made an uneventful recovery and left the hospital on May 7, 1932, feeling fine and happy.

78 WEST TWELFTH STREET.
180 EAST ONE HUNDRED AND ELEVENTH STREET.

UTERUS DUPLEX*

L. W. HAYNES, B.A., M.D., F.A.C.S., DETROIT, MICH.

I HAVE reviewed the cases of double uterus from the Harper Hospital in the past ten years and will divide them into three general types. There are eleven in all; six of the bicornate type, one uterus septus, and four of the uterus didelphys type. The majority of these were diagnosed at operation. They were comparatively free from any important symptoms. Two complained of menorrhagia, four of dysmenorrhea, and one of a severe leucorrhea. Three of the bicornate type gave a history of pregnancy and abortion; one with a second pregnancy and a living child. The one case of uterus septus had a pregnancy and aborted at four months. Two of the uterus didelphys type had pregnancies. The first one had two pregnancies both on the left side and both times aborted. The second one had two pregnancies going to term and having one classical and one low section.

The case which I wish to report somewhat in detail because of its rarity, has been included in the above classification under uterus didelphys. However the two halves were unequally developed and one vagina ended blindly above the other; so that one uterus was cut off from the outside.

E. A., aged fourteen. White. Weight 95½ pounds. Admitted to the O. P. D. Harper Hospital March 4, 1930, to the medical section and then to orthopedics. Chief complaint was pain in the lumbar region after each menstrual period and lasting eighteen days. X-ray examination reported as follows. ''A single film of the lumbar spine and sacroiliac region shows no evidence of inflammatory disease involving either the right or left sacroiliac synchondosis and the joint spacing on both sides is quite wide. There is an occult spina bifida involving the upper sacral segment; this structure also being rather high set. The lumbar vertebrae have normal appearance and the intervertebral disk spacing is clear.''

She was then referred to the gynecological service and the following history obtained:

Menses began at thirteen years of age; regular, with occasional cramps in the epigastrium at the time of period. Six months before, she was carrying a two months' old baby when she fell. The period following the fall the cramps were very severe, originating across the sacroiliac joints and radiating into the coccyx and down both limbs posteriorly. These pains lasted thirteen days and were so severe she was confined to bed. They were made worse by bowel movement. These pains have been present each period since. Otherwise she feels perfectly healthy.

Family history was essentially negative. Personal history other than above was negative. Physical examination was negative excepting the abdomen. Blood picture and urine were negative.

Inspection of the abdomen showed a slight fullness immediately above the umbilicus and slightly to the left of the mid-line. Palpation revealed this to be a firm mass extending upward to the left and across the mid-line to the right side. The size of the mass as outlined on the abdomen was 6 by 8 cm. The upper border of the mass was quite irregular. The index finger could be inserted into the vagina and immediately met a smooth, firm mass extending down and back. The cervix could not be felt. Rectal examination revealed this same smooth, firm mass, extending backward just leaving room for the index finger to pass between the mass and the coccyx. Practically the entire pelvis was filled, and this was a part of the same mass described in the abdomen. The types of tumors discussed were hematocele, fibroma, sarcoma, and cysts.

The patient was admitted to the hospital and operated upon March 22, 1930. Examination under anesthesia showed pelvis containing a mass which was tensely cystic; the size of a grape fruit, somewhat irregular over the upper pole. The cervix was displaced to the left and the uterus could be felt occupying the left lower quadrant. Abdomen opened by a left suprapubic paramedian incision. It was found that the condition was one of double uterus; the one on the left being apparently normal, having a tube and ovary attached. On the right side the uterus and tube were found to be greatly distended with what was apparently old blood. The tube being very large and cork screw shape, measured three inches in diameter at the distal end. Below the uterus a cystic mass was felt which protruded into the vagina and was thought to be a blind vaginal pouch connecting with the right cervix. An attempt was made to find the opening through the cervix from the left uterus, it being thought perhaps we were dealing with a double uterus but with a single cervix. This was not the case however, and the bulging mass in the vagina was incised through the vagina, draining off a large amount of old thick blood. A rubber tube was inserted and left in the new opening. A
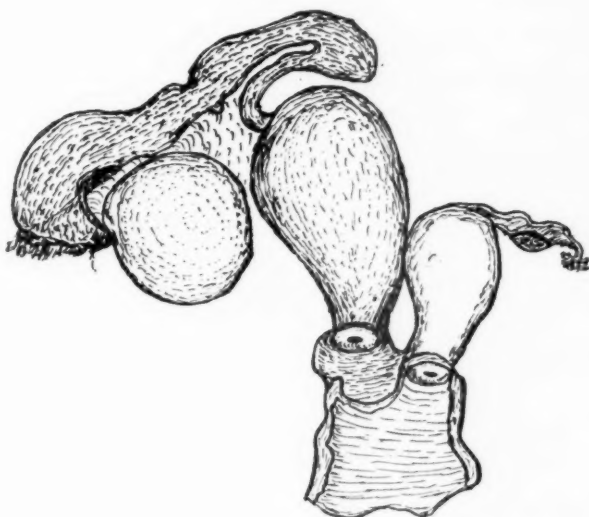

Fig. 1.

supravaginal hysterectomy and salpingo-oophorectomy were done on the right side. The uterus, tube, and ovary on the left side were left intact. An appendectomy was done and the wound closed in the usual manner.

The pathologic report was as follows: Gross specimen: Uterus 4 by 5 by 3 cm. No fibroids. Ovary and tube attached. Ovary was cystic. Ovary showed a collapsed cystic wall. Chocolate cyst. Microscopic: Dilated tube lumen filled with changed blood. Polypoid masses of fimbria in lumen. Cystic inclusion in tube wall lined by squamous epithelium. Simple cyst of ovary. Chronic catarrhal appendicitis.

The vaginal drain was removed on the fourth postoperative day, and she made a normal convalescence, being discharged on the eleventh postoperative day.

She returned to the clinic once a week for the first month, and then every other week for several months. An attempt was made to keep open the sinus into the blind vaginal pouch. However at the end of sixty days this was entirely closed. Thirty days following the operation she had a period which was quite normal and free from pain. She has not been examined since July, 1930, as she has moved from the city. However, we have been in touch with her by correspondence up to the present time, and she has continued

in excellent health. Her periods are every twenty-eight days since the operation, lasting four or five days and she has no pain. Answering the question in a recent letter from her mother, we have replied that we see no reason why she should not marry and have children.

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EXTENSIVE DESTRUCTION OF GENITAL TRACT

NEWELL R. WASHBURN, PH.B., M.D., PHILADELPHIA, PA.

(Assistant Chief Resident Philadelphia General Hospital)

K. D., colored, widow, apparently between sixty and seventy years of age was admitted to the Gynecological Ward of the Philadelphia General Hospital, Feb. 3, 1932, because of complete urinary and fecal incontinence and prolapse of the uterus.

According to the patient's statement she suffered from "piles" and in 1917 a hemorrhoidectomy was done at home. Since that time she has had no control whatsoever of her urine and bowel movements. About three years ago she began to have a prolapse of the uterus. This became progressively worse, and for the past year it has given much pain. She also has lost considerable weight. Has had attacks of diarrhea. She was married in 1901; husband died in 1903. She was never pregnant. She menstruated regularly until her operation fifteen years ago but has not menstruated since. She denies venereal infection, and has never had any growths or ulcers about her vagina.

Examination showed an emaciated old colored woman who looked chronically ill, skin dry, wrinkled, and atrophic. The peripheral vessels were tortuous and calcified to an extreme degree. The lungs were negative except for hyperresonance. The heart was somewhat enlarged to the left, the sounds were of rather poor quality, and there was a systolic murmur over the mitral area transmitted to the axilla. Blood pressure was 160/70. Abdomen was somewhat distended, tympanitic, and soft. There were no masses and no tenderness. Extremities were emaciated.

Laboratory findings were negative.

Gynecologic examination showed many old scars about the labia and pubis and several small polyp-like growths along the edge of the labia majora. The cervix and part of the body of the uterus was visable between the labia, and there was slight ulceration of the cervix (Fig. 1). On separating the vaginal opening there was a laceration which extended from the symphysis to the coccyx, with the uterus protruding from the center. The examining finger placed under the pubis entered a cavity with a large opening from which urine was seen to flow freely and which was apparently bladder. The bladder reflection on the uterus was still present as a blind pocket about 2 inches deep, extending toward the rectum. The ureteral openings could be seen in the bladder cavity. The uterus protruded in the midline and upon lifting the cervix there was found to be a cavity extending upward under the cervix from which feces was slowly flowing. There was no rectal mucosa for about two or three inches in the cavity which was originally rectum. The tissues were very sensitive and bled easily. The examining finger placed in the cavity underneath the cervix and uterus revealed a mild structure at the upper

end which seemed to be Nature's attempt to create a sphincter. Beyond this was normal rectal mucosa.

Biopsies were taken from the eroded area on the cervix and from one of the nodules on the vulva. There was no evidence of either malignancy or granuloma. The section from the nodule was reported as infectious granuloma (chronic).

On Feb. 8, 1932, patient was examined under gas anesthesia by Dr. F. Hurst Maier, Chief of the service. The bladder was exposed and indigo carmine given in the vein; the dye returned through both ureters in nine minutes. Both ureters were easily catheterized as they opened in the center of the bladder cavity. Because of the extensive nature of the pathology it seemed almost hopeless to attempt any repair and the patient was returned to the ward without any operative procedure.

Her condition seemed to grow slowly worse and she complained bitterly of pain. She

Fig. 1.

was unable to turn over in bed because of the protruding, eroded, sensitive uterus and requested that something be done to relieve her. On March 1, 1932, under ether anesthesia the scarred edges of the bladder were denuded and coapted from below upward, leaving a small opening at the upper portion in which an indwelling catheter was placed. The eroded, protruding cervix was amputated and the stump closed over. No attempt was made to repair the perineum and rectum.

The patient reacted well from the operation, the pain was very much relieved and she was able to lie on her side. However, her general condition continued very poor and further surgery was decidedly contraindicated by her condition.

We are still at a loss as to the etiology of this condition. We are inclined to believe that it followed a plastic operation for the correction of a cystocele and rectocele performed in 1917, possibly in a rather unscientific way and after which there was a severe infection with sloughing of the parts. Also there is the possibility that syphilis or granuloma inguinale may have played a part in the story.

CHRONIC HYPERTROPHIC VULVITIS (ELEPHANTIASIS) COMPLICATING LABOR

J. L. REYCRAFT, M.D., AND DAVID SEECOF, M.D., CLEVELAND, OHIO

(Department of Obstetrics and Gynecology, Western Reserve Medical School, Western Reserve University)

THIS unusual condition is always associated with blocking of lymphatic return and is invariably the companion of uncleanliness or profuse, irritating vaginal discharge. Actually the disease is confined to the lower strata of society, and is found most commonly in races having a predisposition to skin hypertrophies. Cases reported in American literature are almost exclusively limited to the negro race.

Mrs. L. W., colored, aged twenty-five, para ii, was admitted to Cleveland City Hospital, in labor, on November 22, 1930. Her last menstrual period had been March 15, 1930.
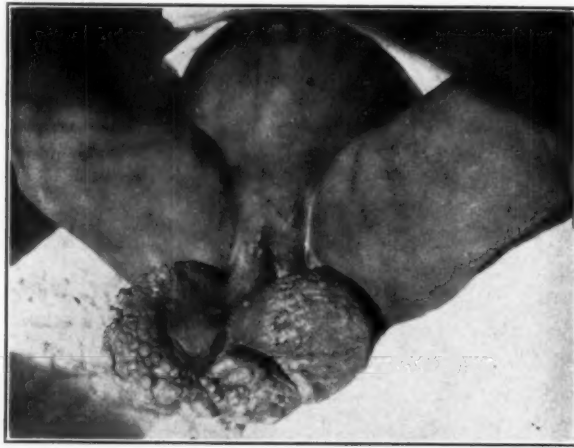

Fig. 1.—Appearance of vulvar mass with patient on her back.

She had had no sickness since childhood; had had one child five years before the present admission without complications. She had noticed a small ''pimple like'' swelling on the left labium at the time of the birth of her first child. There had been no miscarriages. Her first baby was living and well. When she became pregnant the last time there was a swelling in the left labium which was the size of a hickory nut. This had grown to a large size during the pregnancy, but had not caused much inconvenience.

The patient was very obese. The small parts were palpable in the right upper quadrant, the breech was at the fundus, back on the left, head at brim. The fetal heart was not discernible, due to the thickness of the abdominal wall. The pregnancy was apparently at full term.

The genitalia presented a large, bilobuled tumor which originated in the labia (Fig. 1). At first it appeared that there were two tumors, one arising from each labium majus, but upon more careful examination it was found that the tumor itself was lobulated, and its source was the left labium majus. The right labia were edematous, but no tumor was present.

Inasmuch as the head soon presented at the vaginal outlet, delivery was accomplished by the expedient of retracting the tumor over the left groin, after wrapping it in a sterile towel held by an assistant. The delivery was spontaneous, a living girl baby weighing 3600 gm. being born. There were no lacerations.

Immediately after the birth of the baby the tumor mass was clamped at its base with hysterectomy clamps and removed. The base was sutured with mattress sutures of catgut. The tumor weighed 3390 gm.

The mother made an uneventful recovery. Her Wassermann test was negative, also cord blood Wassermann.

The gross and microscopic description of the tumor was as follows:

''There was a bilobed mass united in the midline by a narrow isthmus. The one lobe measured 25 cm. in length and 15 cm. in width. The other measured 20 by 15 cm. The surfaces of both masses were everywhere 'warty' in appearance, the lobulations varying from 0.5 to 2 cm. in diameter. The epidermis was intact and dark. The under surface of the isthmus was moderately injected. The consistency was uniform throughout, being soft and elastic. On section the cut surface was moist, grayish white in color.''

Microscopic description: ''The surface was made up of stratified squamous epithelium. The papillae were tall and quite broad, the subepithelial tissue loosely arranged. Numerous small glands were seen in this tissue. Just beneath the epidermis there were small scattered groups of round cells. In the deeper tissue there were large collections of vessels. The blood vessels were quite numerous, large and thinwalled.''

Diagnosis: Chronic edema with fibrosis of labia; elephantiasis, not filarial.

816 CARNEGIE MEDICAL BUILDING.

REPORT OF A CASE OF OVARIAN FIBROID

H. B. ALSOBROOK, M.D., NEW ORLEANS, LOUISIANA

FIBROIDS of the ovary are sufficiently rare to warrant the report of any cases observed. Hellman made an extensive review of the literature in 1915 and since that date only a few cases have been reported and some of these have not been proved microscopically. Since 1906 only seven cases have been recorded in Charity Hospital of New Orleans, Louisiana, as follows:

SUMMARY OF CASES REPORTED AT CHARITY HOSPITAL
FROM 1906 TO 1931

AGE	COLOR	COMPLAINT	DURA-TION	NO. OF PREG-NANCIES	AGE AT 1ST MENSTRU-ATION	SIDE	ASCITES	TYPE OF OPERATION
56	White	Tumor	3 yr.	10	10	Right	None	Supravaginal hysterectomy Bilateral salpingo-oophorectomy
36	White	Tumor	3 yr.	1	13	Left	None	Bilateral salpingo-oophorectomy
40	White	Swelling	5 wk.	None	16	Left	Yes	Bilateral salpingo-oophorectomy
40	White	Lump in stomach	5 yr.	None	12	Right	None	Bilateral salpingo-oophorectomy
46	White	Pain and swelling	2½ mo.	4	10	Left	Yes	Left salpingo-oophorectomy
33	Colored	Swelling of abdomen	1 yr.	3	15	Right	Yes	Supravaginal hysterectomy Bilateral salpingo-oophorectomy
47	Colored	Pain	2 yr.	None	12	Right	None	Right salpingo-oophorectomy

I. T., thirty-three years of age, colored, married, entered Charity Hospital August 1, 1931, complaining of swelling of the abdomen. In December, 1930, patient noticed that her abdomen began to swell, this gradually increased until it became necessary to have a paracentesis done. This was repeated about July 15, 1931. She complained of shortness of breath when the abdomen was distended with fluid. She suffered a pain under the right costal margin, constant in character and increased upon eating. Menstruation began at fifteen, regular, thirty day type, three days' duration. She suffered with dysmenorrhea but no menorrhagia or metrorrhagia.

She was married in 1928, her husband living and well, two children living and well, one child died at two months of age, no miscarriages.

On admission the abdomen was greatly distended, dullness over the lower half (shifting dullness). The flanks were dull and flared out, the liver was not palpable. A mass was felt in the right lower quadrant of the abdomen.

After paracentesis a pedunculated tumor about 17 cm. in diameter was felt through the abdominal wall. It seemed to be freely movable and no adnexal masses were found
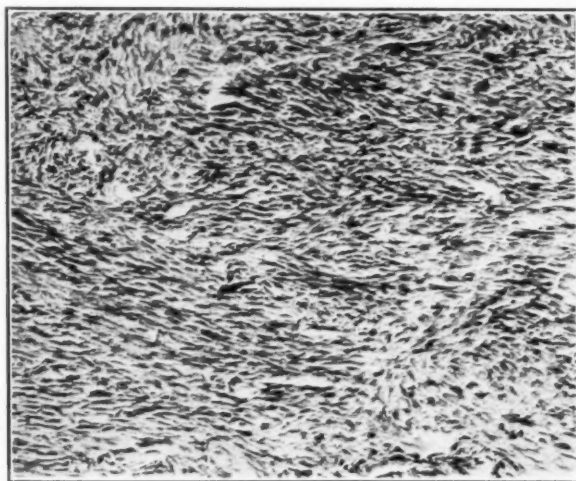

Fig. 1.—Photomicrograph showing leiomyoma fibers. (High power.)

in the left side. A diagnosis was made of a hard tumor of the right ovary, probable malignancy or fibroid.

X-ray examination of the chest and upper abdomen showed a marked elevation of the right diaphragm probably due to enlargement of the liver. Blood Wassermann, blood chemistry and urinalysis negative.

The abdomen was opened through a midline incision from the symphysis towards the umbilicus and 5000 c.c. of a dark straw colored fluid was removed. Exploration revealed, as the salient pathology, a tumor of the right ovary about the size of a large grape fruit, free from adhesions, firm, and hard. Supravaginal hysterectomy and a bilateral salpingo-oophorectomy was performed.

The left tube was stretched over the top of the ovarian tumor; the lumen being obliterated and the walls thickened. The left ovary consisted of a large multilocular mass measuring 9 by 8 by 7 cm. The cysts were filled with straw colored fluid. The right tube measured 7 cm. in length, 0.5 cm. in diameter. On section its lumen was patent, the mucosa showing no changes except congestion of blood vessels. The right ovarian tumor measured 11 by 10 by 10 cm. It is irregular in contour and on section the cut surfaces were roughened in appearance, pinkish white in color and made up of cords of white firm tissue irregularly arranged in whorls in all directions.

Microscopic diagnosis: Fibroleiomyoma.

Society Transactions

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF NOVEMBER 4, 1932

Perforation of a Fibromyomatous Uterus Following Version. Dr. Henry W. Weber. (See page 597.)

A Study of 733 Cesarean Sections. Dr. I. Daichman and Dr. W. Pomerance. (See page 522.)

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, MAY 20, 1932.

Dr. G. F. Hibbert presented a paper entitled, **The Significance of the Streptococcus in Trichomonas Vaginalis Vaginitis.** (See page 465.)

Dr. Alexander G. Gabrielianz presented a paper entitled **Organotherapy of Mastodynia.** (See page 499.)

Dr. Edwin J. DeCosta presented a paper entitled, **Spontaneous Amputation of the Cervix During Labor.** (See page 556.)

Correspondence

To the Editor: The undersigned is desirous of bringing to the attention of the readers of this JOURNAL the *Standard Classified Nomenclature of Disease*, which is based on certain fundamental conceptions that have not been employed previously for this purpose. This book has just been published by The Commonwealth Fund and presents the careful, coordinated work during the past three years of the representatives of 27 national societies and governmental bureaus in the medical, clinical and statistical fields. These representatives have constituted a National Conference, the work of which is worthy of the attention and support of the medical profession.

As compared with previous nomenclatures, this book, which presents a numerical index of diseases, is much more inclusive and takes into systematic account, as most other nomenclatures do not, both the etiology of the disease and the part of the body affected. It is the first classified nomenclature to be developed by national rather than local interests.

The sponsors hope that this standard Nomenclature will promote uniformity in the expression of medical thought and, because of its analytical nature, will encourage greater precision in the analysis of the causes of illness and death. It should thus provide a more accurate basis than any heretofore available for mortality and morbidity statistics, and for the recording and interpretation of clinical experience.

The classification is logical, orderly, and modern. Being the work of all the national associations of medicine, surgery, and the specialties, it is more generally authoritative than any other work of a similar nature. In addition to these advantages, its use is simpler than other nomenclatures (1) because it is complete, (2) because its alphabetic index is three or four times as large as that of any other similar work, (3) because the system permits expansion or contraction of the diagnostic file of the record room in proportion to the demands of the hospital, (4) because the decimal system employed in numbering the diseases facilitates the work of the record room clerk by indicating the exact place in which diagnoses are to be filed.

As stated in the preface, the widespread use of an authoritative and carefully planned nomenclature cannot fail to be instrumental in eliminating the use of many faulty and incomplete designations of disease. Teachers of medicine have already reported that its use in university hospitals exercises an influence upon the accuracy and precision of medical thought among the students and among the staff.

A great deal of time and effort has been expended in the production of this manual which is now offered to the medical profession for their approval and use. Further information may be had from the Executive Secretary of the Conference, Dr. H. B. Logie, New York Academy of Medicine, 2 East 103rd Street, or from the publication office of the Commonwealth Fund, 41 East 57th Street, New York City.

<div style="text-align:right">

GEORGE BAEHR, M.D.,

CHAIRMAN, EXECUTIVE COMMITTEE,
NATIONAL CONFERENCE ON NO-
MENCLATURE OF DISEASE.

</div>

110 EAST 80 STREET, NEW YORK.
MARCH 6, 1933.

THE PFANNENSTIEL INCISION

To the Editor: The January issue of your JOURNAL contains an article by Schochet and Lackner on, "An Instrument to Outline the Pfannenstiel Incision."

The authors state: "It appears to us that the reason there are not a large number of adherents to the Pfannenstiel incision in this country is due to the fact that it is frequently wrongly placed, and the curved transverse incision is not symmetrical with the result, that a poor exposure is obtained."

While the instrument the authors suggest is practical for the performance of a curved scar, per se, the exposure necessary with the Pfannenstiel incision for a given operation is not dependent on the skin flap entirely or its plastic beauty.

It seems to me that a polypragmatic use of such an instrument might at times rather hinder than further the application of this incision. The original Pfannenstiel incision places the skin and fascial division at the same level in a curved line above the pubis in such a way as to make the scar practically invisible within the pubic hair.

The objection of a restricted amount of space at this level of the wound is justified and, therefore, is used mainly if the surgical interference does not demand much room.

However, with a slight modification we are able to increase the necessary room and the indication for the Pfannenstiel incision. The amount of space obtainable depends on the *width* and on the *level* of the transverse incision of the fascia. To be anatomically correct, this structure should be called aponeurosis.

The lower the fascial incision is placed towards the pubic bone, the less, the higher up towards the superior iliac spine, the more room it will supply. For, in the latter case both the upper and lower fascial flaps can be denuded from the linea alba and thus the peritoneal access accordingly enlarged.

Many adherents of the Pfannenstiel incision proceed, therefore, in the following way: A curved skin flap is made within the hair line. After denuding the convex skin flap from the fascia, the former is lifted and the fascial transverse incision done at a higher level. Such a curved skin flap has its limitations. If an exposure should be re-

quired at the uppermost level, the flap might become too large. For this reason, some surgeons make a straight transverse skin-fascial incision at the level desired for the operative work.

The late Professor Franz of the Charité Clinic in Berlin did all his extended Wertheim operations through a straight skin-fascial transverse incision at the level of the anterior superior spines.

The most ideal place for the skin incision is, of course, within the pubic hair. This incision becomes obligatory in such patients in whom a disfigurement of an ugly scar would jeopardize their career, such as actresses or acrobats.

These patients usually have a very firm abdominal wall, a condition which rather tends to decrease the amount of exposure necessary.

In such cases a vertical midline incision in addition to the transverse in the form of an inverted T (⊥) will usually yield the necessary space. Absolute hemostasis is an urgent requirement for a transverse incision. In closing the skin, the use of a subcuticular silk worm stitch makes the wound practically invisible.

The withdrawal of such a single stitch, particularly in the curved transverse incision, is often painful. To obviate this difficulty I am using two sutures which meet in the middle and are brought out above the pubis subcuticularly, distal from the incision.

The advantages of the Pfannenstiel incision are numerous. First, its esthetic value. Transverse scars are linear; they never become as wide as some vertical scars. Second, its anatomic value: The integrity of the nerve supply of the rectus muscle is preserved, and the fascial edges are approximated naturally because the lateral pull tends to close the incision.

For these reasons the sequel of a ventral hernia is practically excluded even in cases in which the wound suppurates.

These considerations make the Pfannenstiel incision particularly valuable in obese patients, in whom the sequel of a ventral hernia is more frequent and very annoying.

The fact that the technic requires a little more time and trouble is hardly a valid criticism in view of the obvious advantages to the patient.

1243 ROOSEVELT BUILDING, LOS ANGELES, CALIF.   FRED LINDENBERG, M.D.

Item

THE AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

The annual dinner and Round Table Conference will be held informally at the Hotel Schroeder, 7 P.M., on June 14, which is the first day of the scientific session of the American Medical Association. Addresses will be made by one or more of the officers and a general discussion of Board activities will follow. New Diplomates granted certificates at the examination held immediately preceding the American Medical Association Convention will be introduced individually.

All Diplomates of the Board are urged to attend. Physicians interested in obstetrics and gynecology are invited to be present. The dinner will be by subscription and reservations may be made in advance through the office of the Secretary. Additional tickets may be purchased at Registration Headquarters, or at the Hotel Schroeder.

The next general clinical examination of the Board is to be held in Milwaukee on Tuesday, June 13, 1933, immediately preceding the annual session of the American Medical Association. Reduced railroad rates will apply.

For further information and application blanks address the Secretary, 1015 Highland Building, Pittsburgh, Pennsylvania.

LIST OF DIPLOMATES WHO HAVE BEEN CERTIFIED BY THE AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY TO APRIL 1, 1933

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VAN AUKEN, W. B. D., TROY
VAN ETTEN, R. C., NEW YORK
WARD, G. G., NEW YORK
WARD, WILBUR, NEW YORK
WATSON, B. P., NEW YORK
WELTON, T. S., BROOKLYN
WILENS, IRA, NEW YORK
WILLIAMSON, H. C., NEW YORK
WILSON, K. M., ROCHESTER
WING, L. A., NEW YORK
WOLFE, S. A., BROOKLYN

NORTH CAROLINA

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LEE, T. L., KINSTON
ROSS, R. A., DURHAM

NORTH DAKOTA

MOORE, J. H., GRAND FORKS

OHIO

BILL, A. H., CLEVELAND
*BONIFIELD, C. L., CINCINNATI
DOUGLASS, M. D., CLEVELAND
FULLERTON, W. D., CLEVELAND
GARDINER, J. P., TOLEDO
GOODMAN, S. J., COLUMBUS
HOERNER, J. K., DAYTON
KRIGBAUM, R. E., COLUMBUS
MILLER, THEODORE, CLEVELAND
PIERCE, J. M., CINCINNATI
REYCRAFT, J. L., CLEVELAND
ROGERS, ANDREWS, COLUMBUS
SMEAD, L. F., TOLEDO
TATE, M. A., CINCINNATI
WEIR, W. H., CLEVELAND

OKLAHOMA

CHARBONNET, P. N., TULSA

OREGON

ADAMS, T. W., PORTLAND
MATHIEU, ALBERT, PORTLAND
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SCHAUFFLER, G. C., PORTLAND
WATKINS, R. E., PORTLAND

PENNSYLVANIA

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BARNARD, E. P., PHILADELPHIA
BEHNEY, C. A., PHILADELPHIA
BLAND, P. B., PHILADELPHIA
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CHALFANT, S. A., PITTSBURGH

CLEMMER, LEON, PHILADELPHIA
CRAIG, E. B., PHILADELPHIA
ELY, W. C., PHILADELPHIA
FISHER, J. M., PHILADELPHIA
FOULKROD, COLLIN, PHILADELPHIA
GILLIS, R. A. D., PITTSBURGH
HAMMOND, F. C., PHILADELPHIA
JAMES, D. B., PHILADELPHIA
JAMES, J. E., JR., PHILADELPHIA
KATZ, DAVID, PITTSBURGH
KEENE, F. E., PHILADELPHIA
KIMBROUGH, R. A., JR., PHILADELPHIA
KOCYAN, J. J., WILKES-BARRE
LONGAKER, DANIEL, PHILADELPHIA
*McCULLOUGH, F. J., PHILADELPHIA
MACFARLANE, CATHARINE, PHILADELPHIA
MAZER, CHARLES, PHILADELPHIA
NICHOLSON, W. R., PHILADELPHIA
NORRIS, C. C., PHILADELPHIA
PARKE, W. E., PHILADELPHIA
PIPER, E. B., PHILADELPHIA
RAYMOND, W. C., JOHNSTOWN
REEVES, T. K., PITTSBURGH
SCHUMANN, E. A., PHILADELPHIA
STEVENSON, J. W., PITTSBURGH
STURGIS, MARGARET C., PHILADELPHIA
TAYLOR, J. S., ALTOONA
TITUS, PAUL, PITTSBURGH
TRACY, S. E., PHILADELPHIA
VAUX, N. W., PHILADELPHIA
WILLIAMS, P. F., PHILADELPHIA

RHODE ISLAND

APPLETON, PAUL, PROVIDENCE

SOUTH CAROLINA

WILSON, L. A., CHARLESTON

TENNESSEE

BLACK, W. T., MEMPHIS
BURCH, L. E., NASHVILLE
PRIDE, W. T., MEMPHIS
REINBERGER, J. R., MEMPHIS
SCHREIER, P. C., MEMPHIS
*TOOMBS, P. W., MEMPHIS

TEXAS

BOURLAND, J. W., DALLAS
COOKE, W. R., GALVESTON
HANNAH, C. R., DALLAS
MAXWELL, W. W., SAN ANTONIO
PASSMORE, B. H., SAN ANTONIO
ROBINSON, H. R., GALVESTON

VERMONT

EASTMAN, O. N., BURLINGTON

VIRGINIA

ANDREWS, C. J., NORFOLK
BAUGHMAN, GREER, RICHMOND
GRAY, B. H., RICHMOND
RUCKER, M. P., RICHMOND

WASHINGTON

BELL, W. W., SEATTLE
THOMPSON, G. G., SEATTLE

WEST VIRGINIA

BLOSS, J. R., HUNTINGTON

WISCONSIN

CAMPBELL, R. E., MADISON
DAVIS, C. H., MILWAUKEE
HARRIS, J. W., MADISON

CANADA

CLELAND, F. A., TORONTO
HENDRY, W. B., TORONTO
LITTLE, H. M., MONTREAL
SCOTT, W. A., TORONTO
VAN WYCK, H. B., TORONTO

SYRIA

DORMAN, H. G., BEIRUT

*Deceased   *Deceased

Department of Reviews and Abstracts

Conducted by Hugo Ehrenfest, M.D., Associate Editor

Selected Abstracts

Miscellaneous

Popoff, N. W.: Testicular Tubular Adenoma of the Ovary, Arch. Path. 9: 31, 1930.

This is one of the rarest tumors encountered in the ovary. Although it is probably nonteratoid, its structure, origin and possible relationship to hermaphroditism involve the question of embryogenesis of the sex glands. Whether these tumors arise from germinal anlagen, male or female differentiated sex cells or undifferentiated sexual primordial elements is still unknown. It is further unknown whether adenoma tubulare ovarii testiculare (the name originally given to this tumor by Pick) is equivalent to hermaphroditism or to postnatal changes of the gonads.

A case is reported where such a solid tumor was removed from the right ovary. The patient had a child two years previously and presented no signs of hermaphroditism. The tumor reached a considerable degree of differentiation with morphologic formations of the embryonic male type. No signs of secondary sex changes were present. Shortly after the operation, normal menstruation was reestablished and three years later the patient gave birth to a normal female child. The author concludes that morphologic peculiarities of the ovary and biologic factors determining sex differentiation offer a logical explanation of spontaneous reactivation of the medullary cords of the ovaries and germinal epithelium with consequent organoid transformation. Embryologic, zoologic, and experimental data give preference to the term ''sex reversal'' rather than hermaphroditism. W. B. Serbin.

Settergren, F.: Non-Teratomatous Bone Formation in the Ovary, Acta obst. et gynec. Scandinav. 12: 1, 1932.

Genuine bone formation was found in one ovary, which was about normal size. Hitherto, only 27 cases of unmistakable bone formation have been reported in the literature.

Since calcium deposition in the ovary is more common than bone formation, and since these deposits resemble bone in consistency, microscopic examination after decalcification is necessary if a reliable diagnosis of actual bone formation is to be made. In all the 27 cases collected by the author, the presence of bone tissue was determined by microscopy. These cases do not through their own symptomatology make a diagnosis possible. Perhaps the cases that are never diagnosed, make up a not inconsiderable number. It is also possible that bone tissue would be more frequently found if all extirpated ovaries were routinely subjected to microscopic examination.

The author reports a case of extensive calcification through the entire ovary, as well as genuine, fairly abundant bone formation which appears to be mainly restricted to the corpora atretica. No cartilaginous tissue was seen anywhere. This was therefore not aberrant cartilage which had petrified, but calcified ovarian tissue. The absence

of every abdominal tissue other than the bone formation in the calcified parts of the slightly inflamed ovary excluded the possibility of this being a teratoma.

The etiologic factors behind the earliest stages of the process in the ovary are, if not a tumor, then accumulation of connective tissue, possibly owing to inflammation.

J. P. GREENHILL.

Vincent, G.: Lesions of the Pelvic Ureter Produced During the Course of Gynecologic Interventions, Bull. de la soc. d'obst. et de Gynée. **3:** 208, 1932.

Vincent emphasizes that injuries to the ureters during gynecologic operations are much more common than is generally believed. The lesions of the ureters consist of section, ligation and secondary necrosis. Longitudinal section of the ureter generally results in spontaneous cure, whereas ligation more often leads to silent destruction of the involved kidney. Transverse section terminates in the formation of a fistula which leads to atrophy or infection of the corresponding kidney. In general, nearly all the surgical lesions of the ureter eventuate after a variable delay, in functional destruction of the corresponding kidney.

The diagnosis of ureteral injury is not always easy to make at the time of the gynecologic operation. Later it manifests itself by the appearance of a fistula and still later by stricture of the ureter as determined by means of cystoscopic examination, ureteral catheterization and uretero-pyelography.

The treatment of ureteral injuries is not easy. There is a choice between repair of the ureter and implantation of the ureter into the bladder, the rectum or the skin. The value of all of these procedures is only mediocre. If at all possible, nephrectomy is the radical procedure for these injuries.   J. P. GREENHILL.

Frigyesi, J.: Simpler, Improved Method of Local Anesthesia for Gynecologic Abdominal Operations, Monatschr. f. Geburtsh. u. Gynäk. **90:** 64, 1932.

Frigyesi's new technic is similar to the performance of hypogastric anesthesia, the essential difference however, being that 30 c.c. of a one-half per cent solution of novocain solution are injected not at both sides of the fifth lumbar vertebra, but at the third. In a series of 112 cases, there was complete anesthesia in 90.1 per cent, and partially satisfactory anesthesia in 9.9 per cent. There were no failures and no mortality. The morbidity was 9.9 per cent and there were disturbances in wound healing in only nine cases. There were no cases of pneumonia or thrombosis. Among 91 laparotomies there were 42 supravaginal hysterectomies, 27 adnexotomies and eight ventrofixations.

The author bemoans the fact that fatalities and serious complications still occur after inhalation and spinal anesthesia for such minor operations as plastic operations on the vagina. On the other hand, he does not expect all extensive abdominal operations to be performed under local anesthesia.   J. P. GREENHILL.

Apajalahti, A.: The Causes and Treatment of Urinary Tract Fistulas With Special Reference to the Method of Four Catgut Layers, Acta obst. et gynec. Scandinav. **11:** 1, 1931.

This report by Apajalahti deals with 209 cases of urinary tract fistulas. Of this number 180 or 86 per cent were vesicovaginal, 9 were urethrovaginal, 9 vesicocervical, 8 ureterovaginal, and three fistulas were of unknown origin. The etiology was as follows: (a) 154 or 80 per cent were obstetric fistulas and were due either to pressure or to injuries resulting from obstetric operations. (b) 39 or 20 per cent were gynecologic fistulas and these originated either in operations (27 cases) or as the result of pressure by pessaries (3 cases), or as the result of criminal abortion (2 cases) or they were of pathologic origin (carcinoma 5 cases, tuberculosis 1 and typhus 1).

There were more primiparas than multiparas. Delivery was spontaneous in 56, operative in 69 and the type was not stated in 30. The incidence of stillbirths was 97 per cent.

The gynecologic fistulas resulted chiefly after extirpation of the uterus. From 1901 to 1929, vaginal fistulas followed in 3.8 per cent of all the Wertheim operations for cancer of the uterus.

Out of the 45 cases treated conservatively by permanent catheterization, 10 were cured. For the 159 fistulas treated by operative means 260 operations were performed. In 118 cases there was a cure (74 per cent), in 21 cases improvement, in 15 cases no improvement and 2 patients died. The incidence of cure decreased with the increase in the number of operations. Thus there were 60 per cent of cures after the first operation, 30 per cent after the second, 24 per cent after the third, 10 per cent after the fourth and none after the fifth. The best results were obtained by the four catgut layer method of Wichmann. According to this operation the bladder wall is sutured first, then the paravesical connective tissue, then the paravaginal connective tissue and finally the vaginal wall.   J. P. GREENHILL.

Gerich, O.: The Question of Eventration of the Intestines in Cases of Postoperative Rupture of the Abdominal Wound, Monatschr. f. Geburtsh. u. Gynäk. **87:** 183, 1931.

A few years ago Sokelow collected from the literature and by means of a questionnaire a series of 614 cases in which an abdominal wound ruptured and the intestines escaped. The death rate in this group of cases was 31 per cent. Gerich reports 5 such cases in a series of 1,000 gynecologic operations. Three of them died. In three of the cases, coughing preceded the rupture of the wound and in the two others there was marked intestinal distention with increased intraabdominal pressure. The author emphasizes that coughing, vomiting, meteorism and other conditions which increase the intraabdominal pressure do not cause rupture of the wound. They are only the last link in the chain of disturbances which lead up to the catastrophe. The type of suture material used is not important because dehiscence of the wound has occurred after the use of catgut, silk, silkworm and silver wire. Neither does the technic of closure nor the too early removal of the suture play a part. The constitution of the individual probably is important. Most of the cases occur in patients who are in the fourth and fifth decades of life but this complication may occur at any age. In Sokelow's large series, 67.7 per cent of all the patients were men. The Pfannenstiel incision is far safer than the median incision but cases of rupture of the wound after a Pfannenstiel incision have been reported. The author suggests that when a laparotomy is to be performed upon a patient who has meteorism or a respiratory disease, a Pfannenstiel incision be used, also nonabortable suture material and the lower third of the incision should be drained. The anesthetic employed during the operation is important. The author uses pernokton and ether.

The diagnosis of eventration of a wound is easy to make. There is nearly always a bloody or serous discharge on the dressings. Thanks to the resistance of the peritoneum, it is rare for peritonitis to develop. If difficulty is encountered in replacing the intestines, these may be punctured. Anesthesia should be employed only in difficult cases. For closing the wound nonabsorbable material should be used and the lower end of the wound should be drained. The sutures should not be removed for a long time.   J. P. GREENHILL.

Bell, Blair W.: Conservative Gynecological Surgery, Brit. M. J. **1:** 653, 1931.

The author takes occasion to wonder why the rugged ''anatomical'' surgery of the earlier times has lingered on in the face of present day ''physiological'' surgery in gynecology. He believes that the ovary should be recognized to be of at least equal

biologic importance to the testicle. The female genitalia can no longer be regarded as local in function as well as in position.

Conservative Ovarian Procedures.—Most ovarian growths can be resected rather than removed with the ovary in toto. He has no cause to regret such procedure—no malignancies developing thereafter. Careful planning is often required to leave an adequate blood supply for the remaining ovarian tissue.

Ovarian grafting, while still in its infancy, may have possibilities in conserving fertility where tubal ablation is not imperative.

Conservative Tubal Procedures.—The author asserts that 70 per cent of a limited number of cases of salpingostomy showed tubal patency later.

Tubal resection is indicated in some instances of ectopic pregnancy, congenital anomalies and infections occluding the tube at a definite place other than the infundibulum.

The success of these procedures can be tested by the subsequent injection of air or lipiodol.

Conservative Uterine Procedures.—A bicornuate uterus may often be surgically united, and many cases of this sort are reported, several with pregnancy following.

The author employs in cases of infection his ''acrophysterectomy,'' a defundectomy with removal of tubes and ovaries as indicated.

Benign lesions of the uterus such as polypi, fibromyomata and endometriomata are very frequently best removed from below leaving the genital tract virtually intact. Mortality and functional results are definitely better when the case is suitable for this route.

Fibromyomata are best treated by enucleation when they are not too numerous, and are uncomplicated in a woman under forty years of age.   FRED L. ADAIR.

Bubis: Puerperal Gynecology, Am. J. Surg. 17: 194, 1932.

Bubis reports a series of 1326 gynoplastic repairs following delivery. Immediate operation was done on 82.7 per cent, and 15.6 per cent were operated upon between the third and sixth days. Hospitalization was not prolonged because of the operation. Complications (one or more) occurred in 45.2 per cent while 54.8 per cent had an uneventful convalescence. Bubis attributes 16.3 per cent of the complications to the delivery plus the gynoplastic repair. He strongly advocates the procedure.

WILLIAM KERWIN.

Garipuy: On the Dangers of Spinal Anesthesia and Chloroform Administered at the Same Time, Bull. de la soc. d'obst. et de Gynée. 5: 412, 1931.

Two cases are reported by Garipuy in which chloroform was administered after spinal anesthesia had failed to produce the desired effect. In both cases classic cesarean sections were performed and both patients died. One woman died on the eighth and the other on the seventeenth day after operation. Autopsies were performed in both instances and in both the uterine wounds were clean and there were no signs of peritonitis. The author believes the deaths were due to the combined use of chloroform and spinal anesthesia. In both cases gastric distention and paralysis of the intestines marked the beginning of the complications which resisted all treatment.

J. P. GREENHILL.

Rech, W.: The Influence of Carbon Dioxide on the Frequency of the Fetal Heart Rate, Arch. f. Gynäk. 147: 82, 1931.

Rech experimented in an attempt to influence the fetal heart rate by changing the proportion of gases found in the blood stream. Contrary to his expectations, he found that an oxygen deficiency, excess oxygen or excess carbon dioxide in the fetal blood apparently had no influence on the fetal heart action. The author believes this

to be significant. He must of necessity disagree with those authors who believe that the variations in the fetal heart rate during labor are due to temporary disturbances in placental respiration. This latter theory though generally accepted, must now be discarded as being absolutely untenable.   RALPH A. REIS.

Henry, Jean-Robert, and Jaur, Lucien: Epidural Anesthesia in Obstetrics, Gynéc. et Obst. 19: 19, 1929.

From their group of cases the authors report 20 of the most typical which show first, that the level of penetration of the needle and therefore of the anesthetic liquid in the canal is of capital importance. High epidural injection is accompanied by a total anesthesia of the entire lower segment. Labor is interrupted and does not commence until after sensation has returned. Given low, it anesthetizes completely the perineum, the vulva, the vagina, the levators, and occasionally the uterine cervix. It brings on a diminution of the pains during the period of dilatation, renders painless the passage of the head over the perineum, and by relaxing the latter, facilitates fetal expulsion. It does not in any way modify the uterine contractions.

Obstetric interventions are more or less facilitated by this mode of anesthesia.

The advantages of this method over spinal anesthesia and general anesthesia consist in the lessened dangers, the absence of shock and of general complications and in its prolonged duration (two to three hours) particularly in the case of low epidural anesthesia.

The inconveniences of this method are in the case of low epidural anesthesia, an absence of anesthesia of the body of the uterus, in the case of high epidural anesthesia, the serious danger of hemorrhages during delivery.

High epidural anesthesia should be reserved for cases in which one wishes to stop the labor for two or three hours, for versions by internal maneuvers rendered difficult by uterine contractions.   GOODRICH C. SCHAUFFLER.

Schockaert, R.: Dystocia From a Hysterocele in a Case of Double Uterus; Cesarean With Total Hysterectomy, Bruxélles-méd. 10: 1145, 1930.

A woman, age thirty-six, para vi, was admitted to the hospital complaining of a tumor between the legs. She was near term and on the day of admittance, while exerting herself, had experienced a sudden sharp pain with the appearance of the tumor. Examination revealed a large mass projecting between the legs and below the cervix.

The anterior vaginal wall was edematous, the cervix a reddish blue, and gaping, and the posterior vaginal wall could only be seen after lifting the tumor. Palpation revealed the fundus to be 9 fingers above the umbilicus. The head was presenting but not engaged and the fetus living. Vaginal examination revealed a slit to the right and above the cervix which admitted the finger to a depth of 10 cm., and through which the fetal head could be felt. The left cervical canal would admit the finger for 15 cm., and a thin septum was felt separating the two fingers. A diagnosis of double uterus was made and a cesarean done under spinal anesthesia. A living 6½-pound baby was extracted. The second uterus was not seen as it was prolapsed below and hidden between the bladder and rectum. Both uteri were removed in toto and from the old lacerations and scars, either was believed to have been gravid at previous times.   HILTON W. ROSS.

Aburel, E.: Prolonged Local Anesthesia in Obstetrics, Bull. de la soc. d'obst. et de Gynéc. 1: 35, 1931.

The author believes that the ideal local anesthetic is percaine-Ciba with a small amount of adrenalin. In obstetrics he employs local anesthesia during the period of dilatation and during the period of expulsion. He describes the technic he uses.

                                    J. P. GREENHILL.

Arenas: Rudimentary Bicornate Uterus in a Right Crural Hernia. La Semana Medica **11:** 869, 1932.

The patient, an obese woman of twenty-nine years, complained of a painful tumor in the right inguinal region which had been present since she was nine years of age. Had never menstruated.

Examination showed a mass the size of a large orange which could not be reduced. Pelvic examination showed a small vagina, no cervix, no evidence of internal genitalia.

At operation the hernial sac was found to contain the right ovary, tube and right horn of a small bicornate uterus. The left tube was also pulled into the left inguinal ring.

JAMES W. PIERCE.

Books Received

TEXT BOOK OF MIDWIFERY IN THE TROPICS. By V. B. Green-Armytage, professor of midwifery and gynaecology, Calcutta Medical College, etc., etc., and P. C. Dutta, Captain, I. M. S. The Book Co., Ltd., Calcutta, 1933.

CHILD CARE TODAY. By Béla Schick, attending pediatrician in Mount Sinai Hospital, New York, etc., and William Rosenson, chief of clinic, children's out-patient department, Mount Sinai Hospital. Publisher: Greenberg, New York, 1932.

GYNAEKOLOGISCHE UND GEBURTSHILFLICHE DIAGNOSTIK in Tabellenform. Von Professor Dr. Heinz Kuestner, Leipzig. Mit 65 Tabellen und 72 farbigen und schwarzen Abbildungen. J. F. Lehmanns Verlag, Muenchen, 1932.

SCHWANGERSCHAFTSDIAGNOSE AUS DEM HARNE. Von Professor Dr. S. Aschheim, Universitaets-Frauenklinik der Charité in Berlin. Zweite, Gaenzlich umgearbeitete Auflage, mit 11 zum Teile farbigen Abbildungen auf 5 Tafeln. Verlag von S. Karger, Berlin, 1933.

A STANDARD CLASSIFIED NOMENCLATURE OF DISEASE. Compiled by the National Conference on Nomenclature of Disease. Edited by H. B. Logie, M.D., executive secretary. New York, Commonwealth Fund, 1933.

L'OEUF HUMAIN ET SES ANNEXES. Par Maurice Lucien, professeur d'anatomie, et Henry Vermelin, professeur agrégé d'obstétrique à la Faculté de Médecine de Nancy. Avec 78 figures dans le texte. G. Doin & Cie, Paris, 1933.

Erratum

In the article by Castallo, p. 451, of the March issue, the sixth line from the bottom should read ''inserted *over* the lids, etc.,'' instead of *under*.